VOL. 23

NOVEMBER, 1938

NO. 11

The Welding Engineer

MEMBER

Associated Business Papers
Audit Bureau of Circulations
American Welding Society
International Acetylene Association

G. H. MACKENZIE
President and Treasurer

RALPH S. KENRICK
Editor

M. S. HENDRICKS
Promotion Manager

» «

Eastern Representative:
T. E. DEPEW, 1834 Broadway, New York, N. Y.
Tel. Columbus 5-7843.

Western Representative:
L. C. MONROE, 608 South Dearborn Street, Chicago, Ill. Tel. Webster 7134.

Pacific Coast Representative:
W. R. McINTYRE, 446 Western Pacific Bldg., Los Angeles, Calif. Tel. Prospect 0565.

» «

Published on the 15th of each month by The Welding Engineer Publishing Company, 608 South Dearborn Street, Chicago, Illinois. Telephone Webster 7134

Advertising copy must be received not later than the 5th of each month.

IN THIS ISSUE

Our Front Cover
"Arc Welded Road Building Equipment In Production"
—Photo taken in plant of R. G. LeTourneau Co., Peoria, Ill.—Courtesy of Lincoln Electric Co.

Qualification Procedure (Editorial) 15

Cutting Welding Costs (Editorial) 15

Interest in Welding and Cutting Scores a New High During Convention Week in Detroit 17

Helpful Pointers Which Will Insure Success of a Commercial Weldery (A. E. Gibson) 24

Weldability of Nickel-Alloy Steels Aids Fabrication 27

Technique of Arc Welding (Roy Owens) 29

New Product Developments 32

News of the Industry 36

New Technical Literature 44

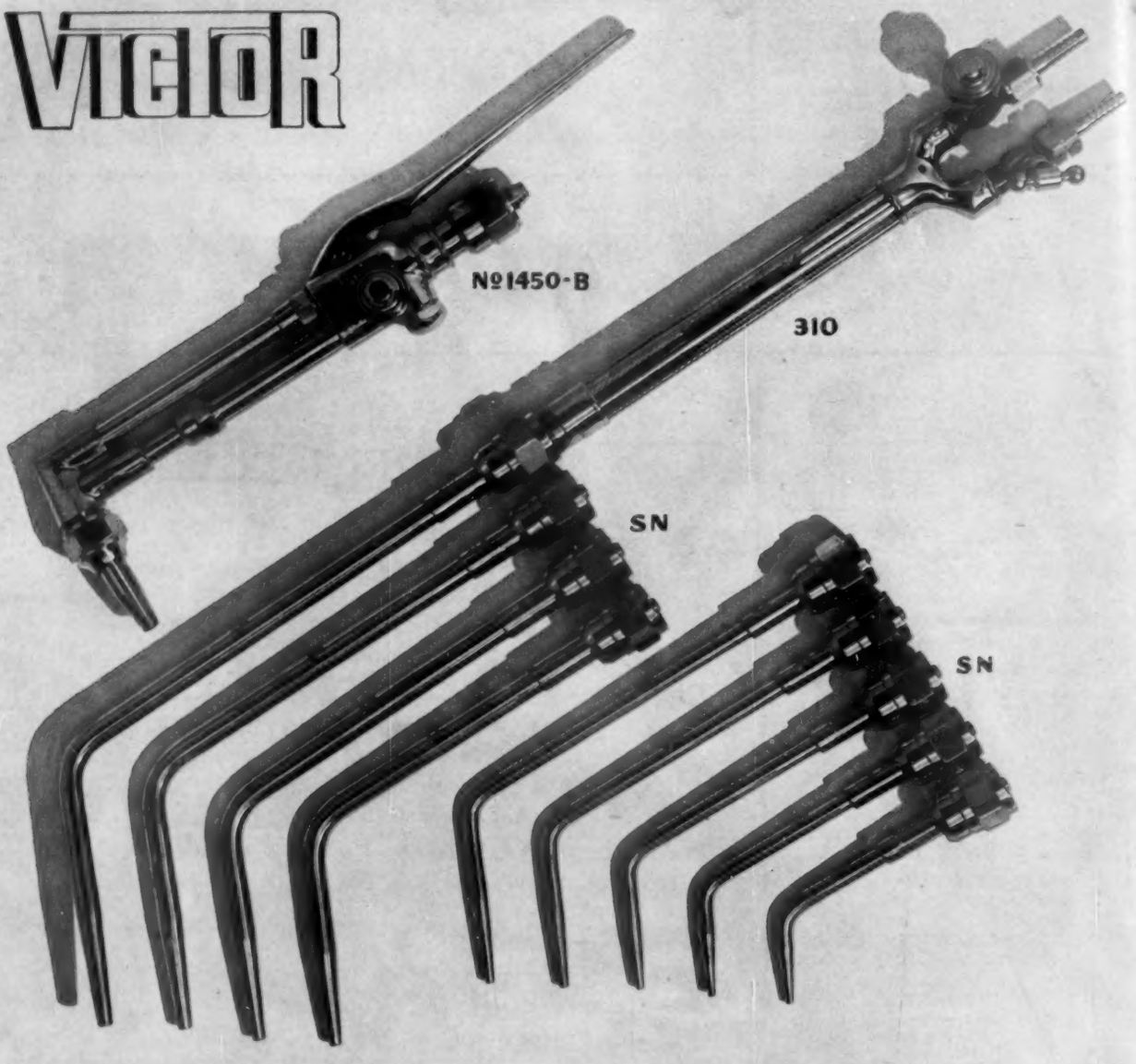
» «

Fleet of Welding Repair Trucks Speeds Equipment Service 23
New Product Developments 32
News of the Industry 36
Personals 37
A.W.S. Activities 37
Future Meetings 38
Trade News 38
Construction 38
Foreign News 40
Current Reviews 41
Recent Patents 41
Trade Literature 43
Classified Page 45

Subscription, payable in advance: United States and possessions, and Canada, $3 a year; Foreign Countries, $4 a year; Single copy, domestic, 25 cents; Single copy, foreign, 35 cents. Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

FOREIGN REPRESENTATIVES: AUSTRALIA and NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand; GREAT BRITAIN—A. D. Baynes, 6, Mordaunt House, Larkhall, Clapham, London, S. W. 8, England; SOUTH AFRICA—J. W. Arnison, 35a Victoria Avenue, Benoni, Transvaal, South Africa; JAPAN—Maruzen Company, Ltd., 6, Nihonbashi, Tori-Nichome, Tokyo, Japan; U. S. S. R.—Mesdunarodnaja Kniga, Kusnezki Most 18, Moscow, U. S. S. R.

VICTOR



8 different nozzle styles—in 69 sizes—make the VICTOR Welding Torch the master of any gas welding operation.

The Cutting Attachment converts it into an efficient cutting torch with a cutting range up to 10″ of metal thickness.

Phone the nearest VICTOR distributor to show you its amazing flexibility.

VICTOR EQUIPMENT COMPANY

WELDING EQUIPMENT DIVISION

844-850 FOLSOM ST. SAN FRANCISCO

3821 SANTA FE AVE. LOS ANGELES

VICTOR DISTRIBUTION POINTS FROM COAST TO COAST GIVE OVERNIGHT SERVICE

Qualification Procedure

IT IS WELL RECOGNIZED that an important function of the American Welding Society is the coordination of welding activities in this country. Standardization of welding procedure is a definite part of this coordination function. It is evident that the interests of standardization have been advanced within the past year, through the cooperation of other technical societies and with the development work of the Committee on Standard Qualification Procedure. This Committee during the past year has revised the A.W.S. "Tentative Rules for Qualification of Welding Processes and Testing of Welding Operators." The new rules have been issued under the title "Standard Qualification Procedure" and copies are now available in pamphlet form and will be sent to anyone interested at 25¢ per copy.

It is hoped that this Standard Qualification Procedure" will be referred to in all the engineering codes dealing with the application of welding, notably the A.S.M.E. Power Boiler Code, the A.P.I.-A.S.M.E. Pressure Vessel Code and the currently revised A.S.A. Pressure Piping Code sponsored by the A.S.M.E.

Simplification of procedure will certainly help the advancement of welding and help to carry it to the position it should rightfully occupy because of its economical advantages and engineering benefits. Of even greater importance is the assurance that the progress of welding will be on a sound conservative basis, when all important welding is conducted in accordance with standardized procedure for qualifying the process and the operators.

Cutting Welding Costs

IS IT ECONOMICAL to keep old welding machines in service on production jobs? A. E. Gibson, co-author of the Lincoln prize-winning paper published in part elsewhere in this issue, says definitely "no." Mr. Gibson believes that five years is the extent of time welding machines should be kept in service. "Not that the equipment is worn out in that period—we know of many welding machines which have been in continuous operation for 10 or 12 years—but that the developments perfected make it advisable to adopt this program." It is the practice of Wellman Engineering Co. to depreciate welding machines over a period of five years. Thus, in turning them in on new equipment at the end of five years no book loss is sustained. The machines available today are so well built that little or no upkeep is needed during the first five years of their service life.

Plate bending brakes are effective tools in cutting welding costs because they eliminate considerable welding labor. With this type of machine, it is possible to bend a plate into a channel shape and eliminate two welded seams which would be required if the channel were to be fabricated by welding three plates. Even though a bending brake eliminates welding labor, the net result is the advancement of welding, because it lowers the cost of welded fabrication, and thereby extends its range of application. In the long run it permits more welding in production shops than would be possible without its use.

Positioning machines, as Mr. Gibson points out, are practically indispensable in the modern weldery. The assembly to be welded, when it is fastened in the positioning machine, can be quickly brought in a proper position for welding at maximum speed. Fast electrodes with fairly heavy currents can be used without danger of under-cutting, and symmetrical fillets are easily obtained. It is estimated that savings in welding time range from 10 to 30 per cent when positioning machines are employed.

AN OPERATION FOR EXECUTIVE ATTENTION

for lower costs · · · for higher quality · · · for profits

● When the wheels of business slow down, every executive has a driving urge to *do* something about it. Here's a plan to convert that urge into *results*... more jobs for workmen ... more earnings ... more service value ... *more profit for everybody.*

Start a *crusade for profits.*

As the first step, appoint from your organization a PROFIT CRUSADER. Such a man will make arc welding the spearhead of his attack. He *knows* from experience that welded steel construction cuts costs and improves products. Fired with zeal and enthusiasm, he develops superior products that cost less to build, less to sell, less to operate and less to service. The PROFIT CRUSADER makes everybody's dollar go farther.

As the second step, give the PROFIT CRUSADER executive *authority* to get results. Mr. R. G. LeTourneau, Pres., R. G. LeTourneau, Inc., Peoria, Ill., is one of the executives who recommends this plan of operation. He says, "To exploit successfully the far-reaching advantages of welded steel construction, the manufacturer or builder should have in his organization a man of authority with a zest for using welding."

We can help you in this crusade for profits. Call on the nearest Lincoln office for counsel or have your secretary write for the book shown below. THE LINCOLN ELECTRIC CO., Dept. CC-544, Cleveland, Ohio. Largest Manufacturers of Arc Welding Equipment in the World.

PROFIT CRUSADER —The man in your organization with a zest for cutting costs and improving products by means of welding. *Everybody profits.*

A book has been compiled giving valuable suggestions for the Profit Crusader. Write for your free copy of "How to Change Over to Welded Design for Profit."

THE LINCOLN ELECTRIC CO.
CLEVELAND · OHIO

J. W. Meadowcroft (right) receives the Samuel Wylie Miller memorial award from Dr. H. L. Whittemore.

Interest in welding and cutting scores a new high during

Convention Week In Detroit

★ Registration at A.W.S. meetings totaled 900—Metal Show attendance, 45000—Several new process developments described

An excellent attendance both at technical sessions and at the exhibits featured the recent annual meeting of the American Welding Society held in Detroit, Mich., October 16-21. Official registration figures showed 900 members registering at the Book-Cadillac Hotel and at the National Metal Exposition (about 25% of the membership). Thus the total registered attendance closely approached the attendance a year ago at Atlantic City, N. J. At the Metal Show, held in Convention Hall, the total attendance exceeded 45,000, which was very gratifying to all the officers of technical societies cooperating. This attendance figure included members of societies and local people who paid admission to see the exhibits, or carried exhibitor's passes.

The Samuel Wylie Miller Memorial Award was presented to J. W. Meadowcroft, assistant works manager, The Edward G. Budd Mfg. Co., Philadelphia, Pa. Dr. H. L. Whittemore, chairman of the award committee presented the medal. Mr. Meadowcroft has written more than 30 papers for the A.W.S. These, as well as numerous patents, have been mostly in connection with the welding of steel automobile bodies.

The James F. Lincoln Gold Medal Award was made in duplicate to the co-authors of the prize-winning paper "Weldability of Casing Pipe," which was printed in the May, 1938 issue of the Welding Journal. James C. Hodge and Cornelius R. Sadler, engineers with the Babcock & Wilcox Co. were the recipients of the Lincoln medals. G. T. Horton, president of the Chicago Bridge & Iron Co., made the medal presentations.

The annual banquet on Thursday evening, October 20, was a huge success from the standpoint of speakers, entertainment and attendance. Slightly more than 600 were crowded into the Grand Ballroom and surrounding balcony.

W. J. Cameron

The high point of the annual banquet held Thursday evening in the Grand Ballroom of the Book-Cadillac Hotel was the forceful address of W. J. Cameron, well known radio commentator and public relations director of the Ford Motor Co. Without beating around the bush, Mr. Cameron plunged immediately into the main theme of his speech which in certain respects was sharply critical of the dilatory and sometimes fatalistic attitude of business executives when faced with serious depression problems. In doing so, Mr. Cameron made it clear that industry does not support people; on the contrary, people must support industry. In other words, the greatest need of business today is more aggressive and persevering salesmanship. He predicted that 1939 will

W. J. CAMERON

Since 1918, Mr. Cameron has held a position of trust and influence in the Ford Motor Co. For the last four years he has been a speaker on the Ford Sunday Evening Hour and editorial comment in the leading publications of the country and thousands of letters to the Ford Motor Co. indicate that these talks are a powerful and stabilizing influence in American life. Mr. Cameron has a fine sense of the value of words and a genius for translating ideas and policies into simple, easily understood English. He has a keen analytic mind and the courage to say what he thinks.

Miller Award Winner

JOSEPH W. MEADOWCROFT was born August 21, 1889, at Philadelphia, Pa. He is entirely self-educated, having started working at the age of eleven, and although still less than fifty years of age, more than thirty-five years of his life have been devoted to vigorous work, a description of which would constitute the story and evolution of the all-steel automobile body. In his executive position as assistant works manager of the Edward G. Budd Mfg. Co., Philadelphia, Pa., he also finds time to keep in contact with the latest welding developments, to which he is still contributing.

In addition to heavy managerial and executive duties which he has shouldered at home and abroad for the Budd Co., Mr. Meadowcroft, as an inventor, has contributed materially in a creative way to the advancement of welding. There have been issued to him about 30 U. S. patents and some 54 foreign patents. Mr. Meadowcroft's patented process for indirect welding of the outer panels of doors of automobile bodies in a manner to avoid any marring by welding has been of outstanding value and continues in use today.

Mr. Meadowcroft is a charter member of the American Welding Society, and has served as vice-president and director of the national organization as well as chairman of its Philadelphia Section. He is also president of the Philadelphia Welding Club, and chairman of the Welding Committee on Research of the Budd Industries. He has written more than 30 papers or articles for the American Welding Society. These, as well as the numerous patents issued to him, have been mostly in connection with the welding of steel automobile bodies.

---

not bring what is popularly known as "good business," but will be essentially a salesman's year. In other words, business will be obtained by effective and unrelenting selling effort. Such expedients as local "Buy Now" campaigns and "Sales Make Jobs" campaigns and their associated banquets and speech making engineered by local business groups are not effective in Mr. Cameron's judgment. Nothing can take the place of hard work and persistent application of the fundamentals of salesmanship. Mr. Cameron reported some typical examples taken from the experience of Ford Motor Co. dealers to prove his thesis.

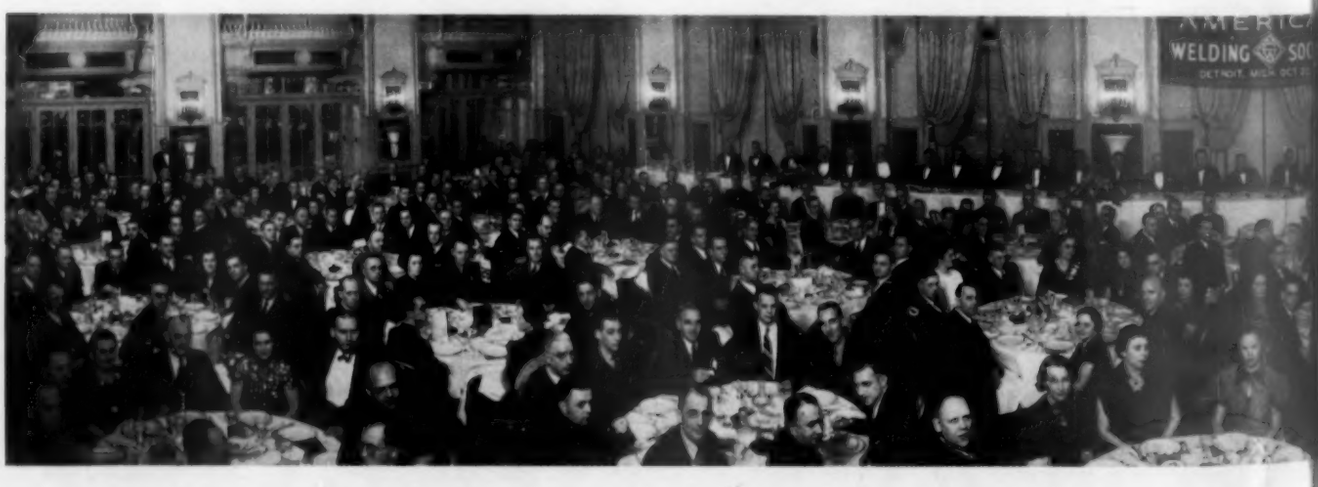
At the annual business meeting Friday morning October 21, Col. G. F. Jenks, first vice president, presented the annual report of the president, because of Mr. Lang's inability to be present. This was followed by installation of the new officers. Harry C. Boardman, the new president, in a brief acceptance speech outlined in a general way the objectives of the Society and dedicated himself to the job of steering its activities in the direction of the objectives he outlined.

President's Report

From the report of Mr. Lang: "During the past year the American Welding Society has continued to function as an agency for the coordination of welding activities in the United States, the assembly, codification and distribution of knowledge relating to this and associated subjects. The tangible results and evidences of its progress are enumerated in the various pertinent sections of this report. The interests of standardization and uniform practice have been advanced. The cooperation of other technical organizations has been invited, with a view to the avoidance of unnecessary labor and overlapping of activities, to the end that, in all points of contact with other fields, coordination may be effected in the manner best calculated to yield satisfactory results."

Mr. Lang also reported that a definite schedule of regional conferences has been formulated for the purpose of more intimately and effectively tying together the various Sections. The first regional meeting of this character was held during March, 1938, in connection with the Western Metals Congress and Exposition at Los Angeles, Calif. Six of the West Coast Sections participated.

Membership in the American Welding Society has continued to grow. Under the capable leadership of A. F. Davis, Chairman of the Membership Committee, there has been a gain of 39.2% during the past year. Member-



ship in the Society as of October 1, 1938 totaled 3,538.

Mr. Lang's report summarized activities of the various A.W.S. committees. It was reported for example that the Committee on Pressure Piping is cooperating with the A.S.M.E. in preparation of a Code for Pressure Piping with specific reference to the welding of pipe joints.

It was reported that during the past year the A.W.S. "Tentative Rules for Qualification of Welding Processes and Testing of Welding Operators" were revised and a new title—"Standard Qualification Procedure" — adopted. It was the belief that the manual arc and gas welding processes demanded immediate committee attention. This "Standard Qualification Procedure" has been approved by the Society's Board of Directors and has been printed in pamphlet form, and is already incorporated, either in whole or in part, in several codes.

The Committee on Standard Tests for Welds, which presented a first draft at the annual meeting a year ago, continued to function and in June, 1938 submitted a revised draft of "Standardized Methods for Mechanical Testing of Welds." This was sent to other committees for study. Since then a few minor modifications have been suggested. Largely on the basis of the agreement reached at these meetings, certain changes have already been made in weld testing methods as provided for in other welding specifications, with the result of reducing undesirable variations in testing methods.

Outline of Work

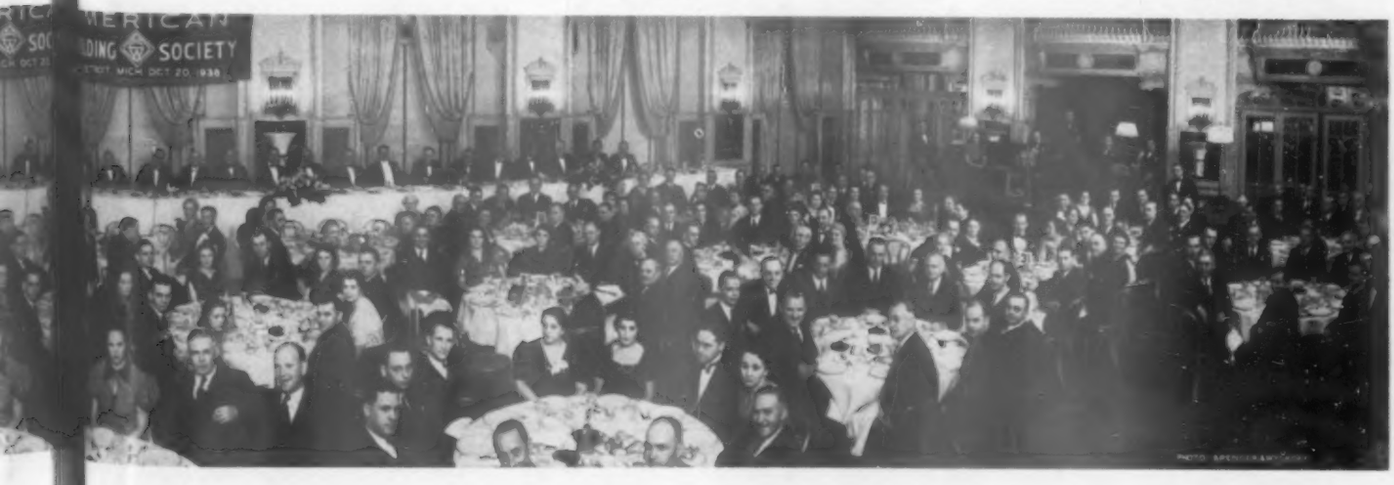
The Committee on Outline of Work was appointed about the first of the year with the broad purpose of coordinating the technical activities of

HARRY C. BOARDMAN—President of A.W.S.

HARRY C. BOARDMAN was born in Plainfield, Ill., in 1887. He graduated from the University of Illinois with the bachelor of science degree in 1910 and entered the employ of the Chicago Bridge & Iron Co., as a draftsman. He later became chief draftsman and designing engineer. In 1916 he became a corporal in the First Illinois Field Artillery, later second lieutenant and captain. During the latter part of 1917 he became Commander of Battery "E," 332nd Field Artillery, 86th Division. He became artillery instructor in 1918 and in October of that year received the rank of major of field artillery. From 1919 to 1922 he was engaged in automobile tire and accessories business in Kansas City, Mo. In 1922 he entered the employ of the International Filter Co., where he held a position as designer and later superintendent of construction. In 1924 he became an instructor in the College of Engineering, University of Illinois, and in 1926 received a C.E. Degree from the university. In the same year he returned to the Chicago Bridge & Iron Co. as research engineer, and has continued in this position since.

He is author of a number of technical articles dealing with storage tanks, pipe lines, mathematics and hydraulics. He is co-author of "Mathematical Tables for Use in Computing Arcs, Chords, and Versines." He holds membership in the following societies: Tau Beta Pi, Sigma Xi, Fellow-American Association for the Advancement of Science, American Society of Civil Engineers, Western Society of Engineers, American Welding Society (ex-Chairman—Chicago Section), American Society for Metals, A.S.M.E Boiler Code Committee and American Petroleum Institute.

Over 600 members and guests were assembled in the Grand Ballroom, Thursday evening to fraternize and relax—W. J. Cameron, of Ford Motor Co. was keynote speaker.



J. C. HODGE—Co-winner of Lincoln Medal.

JAMES C. HODGE was born in 1902 at Falkirk, Scotland. In 1916 he came to America, completing his secondary education in Cleveland, Ohio. He received his B. S. degree from Case School of Applied Science in 1923, majoring in metallurgy under Professor H. M. Boylston. For four years after gradution he was associated with Messrs. Barnett and Christensen, consulting chemists, serving a number of foundries in Ohio and Indiana. In 1927 he joined the Babcock and Wilcox Co. to investigate the status of the various welding processes and to develop a process of welding suitable for construction of boiler drums.

His experimental work during this period contributed to a better understanding of the behavior of steel in metal arc welding and of the functions of coverings on electrodes in producing ductile weld metal. He was associated with Professor H. F. Moore in the classical experiments of the Babcock and Wilcox Co., involving fatigue tests on full sized drums and shells of riveted and welded construction. His investigations of methods of non-destructive testing welded joints are also well known, and he became a recognized authority in this field.

His later work has included studies on the weldability of the low-alloy constructional steels and of the various heat-resistant and corrosion-resistant steels, in the metallurgy of which he has also gained a considerable reputation. Dr. Hodge has cooperated in the activities of many of the engineering societies, serving on a number of the technical committees of the American Society for Testing Materials, the Boiler Code Committee of the A. S. M. E., the Welding Research Committee of The Engineering Foundation, The American Welding Society and the American Petroleum Institute. He has made many contributions to the technical literature on welding, being co-author of two chapters of the Welding Handbook of the American Welding Society.

the Society and for stimulating progress in such activities.

The committee has held several meetings and has disposed of a number of matters by correspondence.

The committee formulated a set of rules relating to policy matters governing technical committee activities and the relation of technical committees to the Committee on Outline of Work. These rules are being presented to the Board of Directors for consideration and adoption.

Some of the recommendations made by the Committee on Outline of Work and adopted by the Board are:

1. The appointment of a Pressure Piping Committee identical in personnel with the Committee on Pressure Piping—Welding Fabrication of the American Standards Association.

2. Appointment of a small committee to look into the need for standardization of training and qualification of welding inspectors.

3. Appointment of a small committee to suggest ways and means for the promotion of welding education in engineering schools.

4. Appointment of a joint committee with American Water Works Association for the welding of elevated storage tanks.

It has also looked into the personnel and made recommendations in regard thereon in connection with the Committee on Building Codes and representation on A. P. I. Subcommittee on Field Welding of Casings.

It has attempted correlation and coordination between the Definitions Committee, Standard Qualification Procedure, Building Code Committee, Oil Storage Tank Committee, Symbols Committee and Hydraulic Pipe.

All in all, the committee believes that there is a definite need for some such coordinating committee as the Committee on Outline of Work and that such a committee can perform a useful and important function.

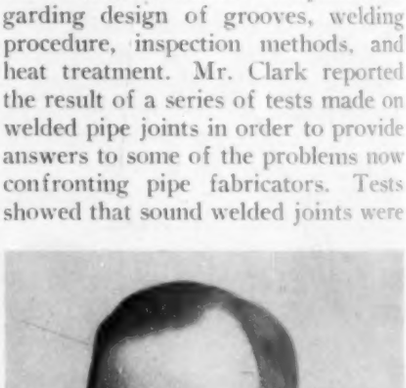
Review of Papers

Space does not permit reviewing all of the technical papers presented at the Detroit meeting. In following paragraphs we present reviews of some of the papers. These were selected as probably being of greatest interest to our readers.

Robert M. Wallace, assistant superintendent of the Griscom Russell Co., Massillon, Ohio, presented a very thorough technical paper covering the application of the new Unionmelt electric welding process as applied to the fabrication of unfired pressure vessels. With this new tool, the author stated that fabricators can improve the quality of their products and lower production costs. His paper was amply illustrated with photographs and sketches of joint designs, etched macrographs, and numerous photo-micrographs of specimens taken at different points in the region of the weld. In addition to high thermal efficiency, the author pointed out that this single-pass welding produces excellent physical properties from the standpoint of hardness and ductility. The high heat input per unit of plate section and the heavy slag covering slow up the cooling rate and produce desirable physical properties. "With a little more than one year of successful experience," said Mr. Wallace, "it has been determined that consistent results are obtained with improved quality."

Welded Pipe Joints

"Welded Joints in Carbon-Molybdenum Piping" was the subject of a paper presented by R. W. Clark, engineer in the Works Laboratory of General Electric Co., Schenectady, N. Y. Owing to the increasing use of welded "carbon-moly" pipes, there have arisen differences of opinion regarding design of grooves, welding procedure, inspection methods, and heat treatment. Mr. Clark reported the result of a series of tests made on welded pipe joints in order to provide answers to some of the problems now confronting pipe fabricators. Tests showed that sound welded joints were



E. V. DAVID—Chairman, technical program committee.

M. M. KELLY—Secretary of A.W.S.

made with each of four different types of groove designs. Mr. Clarke further pointed out that by pre-heating and concurrent heating of pipe to a temperature of 300 to 500 deg. F. the temperature gradient is lessened. With lower temperature gradient, the magnitude and concentration of residual stresses are less. Pre-heating and concurrent heating are beneficial in welding relatively thick sections, including the alloy steels. They are also very helpful when welding pipe structures in cold weather.

Medium-Carbon Steel

"Weldability of Medium-Carbon Steel" was the subject of a research paper presented by R. W. Emerson, research engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The author drew an analogy between welding and heat treatment processes. Most of his paper was devoted to a discussion of the influence of plate thickness and welding current on the rate of cooling of butt welded joints. Cooling curves were presented for both single-pass and multiple-pass welds, and also for welds made on preheated plate. In presenting these curves Mr. Emerson emphasized the importance of the slope of the cooling curve during the short interval following the peak temperature reached during welding.

This is important because when the plate cools more rapidly than 10 to 15 deg. per second, while passing through a certain critical range of temperature (500 to 650 deg. C.), the heat-affected zone is very likely to develop a martensitic or brittle structure. The rate of cooling at sub-critical temperatures (below 1350 deg. F) is the most important controlling factor. Welding speed and welding current do not directly affect the micro-structure and physical properties of the heat-affected zone, but indirectly they are controlling factors because they influence the rate at which the weld zone cools. Mr. Emerson recommended preheating temperatures of 100 to 300 deg. C. (212 to 572 deg. F.) when welding heavy sections of .30 to .50 per cent carbon steel. He also indicated that stress relieving is considered beneficial in welding medium-carbon steels.

Oxygen Cutting

G. M. Deming, engineer of Air Reduction Sales Co., New York City, presented a very practical paper on "Oxygen Cutting," pointing out that minimum costs are only obtained when fundamental principles of machine cutting are full appreciated. Progress in this particular field has been very rapid and it is uneconomical to retain obsolete cutting equipment. The author emphasized that every item, including the machine, pressure regulators, hose, torch, and tips must measure up to very definite standards. Mr. Deming further pointed out that a great deal of poor quality work may be traced to careless or ignorant abuse of machines, torches, and cutting tips. He pointed out the important variables which govern the quality and efficiency of oxygen cutting. His paper was presented with the aid of numerous diagrams, many of which can be found in the chapter on oxygen cutting in the A. W. S. Welding Handbook.

Flame Hardening

"Flame Hardening" was the subject of a highly practical paper presented by John Sheppard, chief metallurgist of Kelsey Hayes Wheel Co., Detroit. As many readers probably know, flame hardening is a process whereby the surface of ferrous metal, capable of hardening by heat treatment, is locally hardened by heating with an oxy-acetylene flame to a temperature above the critical point and water quenching from that temperature. This gives a hard wear resistant surface but retains the core in all its original toughness and ductility. Mr. Sheppard pointed out that no chemical change is made in the hardened surface, thus differentiating flame hardening from case hardening and other processes which alter the surface composition.

Mr. Sheppard listed the types of metals which can be flame hardened, these being the principal materials employed in machine construction—medium-carbon steels, semi-steels and alloyed cast irons. The author indicated that flame hardening possesses certain definite advantages over furnace hardening by preventing distor-

---

CORNELIUS R. SADLER was born in Montgomery, Alabama, in 1875. In his early youth he took an apprentice course as a mechanic, following which he spent several years at various mechanical jobs in the South. In 1901 he came north and shortly thereafter made a connection with the Stirling Boiler Company, later The Babcock & Wilcox Co. at Barberton, Ohio, and has been with this concern ever since, serving in various capacities, and is now vice-president of The Babcock & Wilcox Tube Co. at Beaver Falls, Pa. During this period Mr. Sadler has been active in the development, design and manufacture of steam boilers and their auxiliaries for land and marine service, and the designing and building of machinery for manufacturing them.

Upon the introduction of fusion and resistance welding, Mr. Sadler recognized its possibilities for replacing the various types of mechanical joints previously used in pressure vessels, tubular goods, etc., and took steps for the development of improved welding technique as well as non-destructive testing of welded structures.

During recent years Mr. Sadler has devoted his time to the development and manufacture of tubular goods at the Beaver Falls plant. Through his many visits to the oil fields he became interested in their problems of welding applications, resulting in his investigation of casing welding as reported in a joint paper with Dr. J. C. Hodge "Weldability and Properties of Materials for Casing Strings."

C.R. SADLER—Co-winner of Lincoln Medal.

VAUGHAN REID—Chairman, local arrangements committee.

A. W. S. Convention Committee

C. A. McCUNE, general chairman
M. M. KELLY, secretary
J. B. TINNON, chairman, manufacturer's committee
E. V. DAVID, chairman technical program committee
VAUGHAN REID, chairman of local arrangements
D. H. COREY, chairman, Detroit Section
E. J. ROSSEAU, secretary, Detroit Section

J. D. TEBBEN, chairman, President's Reception
S. M. HARVEY, chairman, entertainment committee, Annual Dinner Dance

C. A. McCUNE—Treasurer, and general chairman of convention committee.

tion in large or complicated shapes. A further comparative advantage is that the hardness can be confined to definite areas. An important economic advantage was indicated by the author; cheap carbon steels can be flame hardened and used to replace more expensive alloy steels, for many applications calling for a high degree of wear resistance.

Operating procedure was given in detail and several applications of flame hardening to cylindrical surfaces and gear teeth were clearly described. Hardening of gear teeth offers one of the best applications of flame hardening, because it is desirable to confine the hardening to a limited area on both sides of the tooth and it is possible to harden gears with practically no distortion. The gear can be machined in the unhardened state, because of this minimum degree of distortion.

Oil Well Casing

W. Mike Murphy, an engineer with Air Reduction Sales Co., Dallas, Tex., reviewed the developments to date on welding of oil well casing. Starting with a description of the function of well casing, the author presented attractive figures on a potential market for welding in this comparatively new application. Welding offers certain definite advantages in oil casing pipe, notably a positive gas-tight and leak-proof joint. Welding offers an improvement in safety of operation. During running of the casing the string may be rotated to dislodge obstructions in the hole, and if stuck, the pipe may be rotated in either direction without damage or opening small leaks in the joints. More than 3,000 strings of arc welded casing have been run in the major producing areas. The author discussed the welding procedure employed to speed production and cut the time down to an economical basis compared to threaded joints. Mr. Murphy also discussed the various types of welded joints that have been used for this service. Development work is still going on in regard to joint design and it is hoped that this will lead to higher production rates and lower costs.

New Officers of A. W. S.—1938-39

President:

HARRY C. BOARDMAN
Research Engineer, Chicago Bridge & Iron Co., Chicago, Ill.

First Vice-President:

COL. G. J. JENKS
Chief of Technical Staff, Ordnance Dept., United States Army, Washington, D. C.

Second Vice-President:

TURNER C. SMITH
General Petroleum Corp., Los Angeles, Calif.

District Vice-Presidents:

New York—New England:
WENDELL F. HESS
Head of Welding Laboratory, Rensselaer Polytechnic Institute, Troy, N. Y.

Middle Eastern:
W. W. PETRY
Welding Engineer, The Cincinnati Milling Machine Co., Cincinnati, Ohio

Middle Western:
K. L. HANSEN
Consulting Engineer, Harnischfeger Corp., Milwaukee, Wis.

Treasurer:

C. A. McCUNE
Secretary and Director, Magnaflux Corp., New York City.

Directors-at-Large:

C. A. ADAMS
Consulting Engineer, Edward G. Budd Mfg. Co., Philadelphia, Pa.

MARVIN COOK
Humble Oil & Refining Co., Houston, Tex.

F. T. LLEWELLYN
Structural Engineer, United States Steel Corp., Pittsburgh, Pa.

C. E. WOODMAN
Kansas City Bridge Co., Kansas City, Mo.

E. R. Seabloom, engineer, Research Testing Laboratory, Crane Co., Chicago, presented a paper "Bi-Metal Construction of High-Temperature Steam Valves." In this paper he reported results of tests made in the laboratory to find the best hard-facing alloys to use for increasing the service life of valve seats and other valve parts. Mr. Seabloom emphasized that the actual selection of a suitable alloy is an engineering compromise, because no one alloy possesses all of the required properties to the maximum degree. He indicated that a cobalt-chromium-tungsten alloy has been selected as having the best all-around properties for high temperature service.

Truss-Type Side Frame

A. M. Unger, welding engineer, Pullman-Standard Car Mfg. Co., Chicago, described the advantages of a truss-type welded side frame as used in a railway passenger coach. This frame was developed so that the various members would be stressed uniformly. Very thin side sheets can be applied, which do not have to withstand any load stress. Mr. Unger pointed out that the weight saving depends upon the reduction in thickness of the side sheets. The author reported the results of tests which were made on an experimental side frame. This was a completely welded frame and the tests showed that the actual

strength of the frame corresponded very closely to the calculated strength and was more than twice as strong as required by the maximum load it was designed to carry. In other words the experimental side frame was designed with a factor of safety of two.

H. C. Drake, director of research, Sperry Products, Inc., Hoboken, N. J., described the flash welding of rails, with particular reference to the installation on the Delaware & Hudson Railroad. In view of the fact that this installation has been reported in numerous trade publications, the author devoted his paper to description of the physical tests which have been made of welded rail joints, notably the fatigue testing machine, known as a rolling load machine developed at the University of Illinois. This equipment can produce full load stresses in welded rail sections, and is capable of reproducing a wheel load of 65,000 lbs. and alternating this load 60 times a minute by means of a motor driven crank. Mr. Drake stressed the importance of stress-relieving welded rail joints. This is necessary because of the high carbon content which would otherwise develop a brittle structure that might lead to fatigue failure. In discussion of the author's paper, it was pointed out by E. T. Howson, vice-chairman of the meeting that there are 125 million rail joints in service and that with longer rails track maintenance expense is reduced. Mr. Howson estimated that about 50 per cent of track maintenance expense represents upkeep of joints.

» «

Fleet of Welding Repair Trucks Speeds Equipment Service

★ Operation of the fleet of field service trucks by R. G. LeTourneau, Inc., Peoria, Ill., has proved an extremely valuable supplement to the company's distributor service. The fleet was established primarily to instruct distributors in the operation of LeTourneau earth-moving equipment in order that customers might in turn be properly informed. The service also provided an excellent means of caring for possible customer service during the 6-months' warranty period of the equipment. Today, the service has grown to the point where it operates as a traveling repair shop, performing every type of service. The trucks are sold to distributors, county road departments, welding service companies and others who see advantages in this efficient unit in their own operations. Many of the trucks have been sold for such purposes, because of their efficiency and flexibility, being capable of traveling at passenger-car speeds.

Fig. 2—Field service truck operated by R. G. Le Tourneau, Inc. to supplement its distributor service.

Fig. 1 — Le Tourneau field service truck on pipeline welding operation.

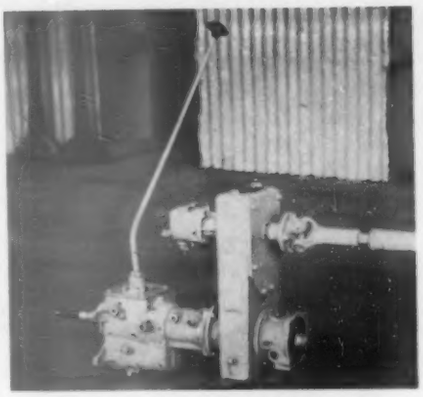


Fig. 3—Power take-off for driving arc welding generator on field service truck.

The service fleet operated by LeTourneau serves the big construction projects, including dams, either earth filled or concrete, highway and bridge building. The service also takes in logging operations and United States Forestry work where roads must be constructed; also coal stripping and iron ore mining, etc.

These trucks, one of which is shown in Fig. 1, are equipped for any type of maintenance work on scrapers, angle-dozers, bull-dozers, rooting machines, etc. Being adequately equipped for general welding, they can be used in pipe line work (see Fig. 1), miscellaneous fabrication and construction.

The equipment carried on the trucks includes: a 200-amp. Lincoln arc welding generator, 200 lbs. of assorted electrodes for repair of worn or broken parts, or for fabrication and construction; flame-cutting equipment for cutting steel plate or shapes and for vee'-ing cracks before welding; and approximately 200 lbs. of steel to provide for work in remote localities where shapes and plate cannot be purchased.

The arc welding generator on the trucks is driven through a special power take-off designed and built by LeTourneau (see Fig. 3). This unit, fabricated by arc welding contains two gears in an arc welded housing, a governor, shaft and universal joint. It is installed by cutting out a section of the truck drive shaft and mounting with the gear box.

Each service truck is in charge of one man who is a skilled arc welding operator and an expert mechanic, thoroughly trained in the principles of construction and operation of earth-moving equipment.

Fig. 1—Savings of from 10 to 30% in welding labor are possible with positioning machines.

Helpful pointers which will insure success of

A Commercial Weldery

★ Winners of first prize in recent Lincoln Award Program relate from years of practical experience how a successful weldery should operate

By A. E. GIBSON and M. W. GIBSON
President and stockholder, respectively, of Wellman Engineering Co., Cleveland, Ohio

In answer to an inquiry as to whether we wished to quote on the fabrication of a welded lathe, we wrote the purchaser asking for the privilege of having an engineer call to discuss their requirements. The request was granted; our engineer called. With the aid of a book of photographs of actual weldments, and a brief description of our engineering, fabricating and research facilities, the engineer convinced the customer of our ability to accomplish the work successfully, and was given their written inquiry and drawings.

In the preparation of our estimate, we included in detail the weights and cost of the various materials required, the labor hours by departments, carried out into labor and shop burden cost, the administration charge, and the engineering and pattern development costs. To the summary of all these items, called the "cost," was added the profit expected and an item called "tax," which is equal to 1% (for 1937) of the selling price to cover the social security tax. The selling price was thus obtained. A proposition stating the conditions upon which we would be pleased to accept their order, was sent to the customer. In due time an order for the work was received. The proper papers for the shop were written; materials not in stock were ordered, and production started.

Only that part of the cost esimate pertaining to the actual welding fabrication will be discussed here. To determine the material cost, the detail drawings were sent to the drafting room where draftsmen figured the gross weight of the metal required. In estimating the labor, each piece was broken up into various operations such as layout and templet labor, shearing, shaping on hydraulic presses or bending brakes, gas cutting, fitting for welding, welding, cleaning and chipping for appearance, painting, and shipping. In estimating the welding time, the actual feet of welding required was ascertained. Knowledge of the number of feet of welding per hour obtained with similar weldments was the basis used for arriving at the welding labor hours.

A data sheet was written, and given to the shop, purchasing department, and cost department. This sheet showed the material and labor listed in the estimate, and was used as a guide for purchases and shop control of labor.

The designer employed one of the most effective methods of cost reduction, not only to reduce welding labor, but to improve the appearance of the product; that is, the use of a bending brake or power press to bend metal, rather than welding two or more plates to obtain the desired shape.

All detail parts were stress relieved after welding and before machining, and were also sand blasted for removal of scale. The completed lathe had all the welds ground, filled, and painted. This procedure was specified by the customer, who desired a product comparable in appearance to that of any modern machine tool.

The welding labor overran the estimate by 20 hrs. due to the insistence of our inspection department that larger fillet welds be made than were originally estimated. The total labor is fairly close to and within the estimate. However, a substantial saving in the cost of the labor-burden item was made, due to a total labor saving of 128 hours and because the actual labor

and burden rate during the period the work was fabricated averaged $1.90 per hour instead of the estimated $2.03 per hour. The reduction of $80.00 in administration was the result of the lower actual hours; an administrative charge of 17½% of the labor and burden was used in the estimate. A saving in the cost of thermal stress relieving and sand blasting resulted from the lower prices obtained at the time of placing this work. A profit of more than 17% was realized on the order.

MANAGEMENT—The success of every weldery is built on the interest, belief in welding, and encouragement of some one executive with authority to act. Regardless of the knowledge of the subject, and the enthusiasm for it among subordinates, little progress can be made unless an executive in the organization is keen for welding. The co-ordination of engineering and fabrication, the necessary expenditure for equipment and supplies, the ceaseless drive for efficiency in design and production, can only result from executive support. The lack of these essentials spells failure, or at best, produces but mediocre success.

Granting that they are convinced of the advantages of welded construction, the management should at once take steps to train some promising individual in the organization for the work, or failing that, they should employ a competent welding supervisor. A competent welding supervisor must be more than a good welding operator. He must have the ability to handle men. He must be firm in his insistence that a worker give a dollar's service for a dollar in pay, have a knowledge of welding costs, of strength of materials, of metallurgy, of metallography, of machining operations. He should have the knack of devising short-cuts and inexpensive appliances to facilitate work. He should keep in close touch with the actual hours of welding. A good welding supervisor should be alert in scrutinizing the appearance of welds to disclose defects, and should bring to the attention of the engineer suggested changes in design in order to better the product or to reduce the cost.

OPERATOR QUALIFICATIONS AND TRAINING—Operators are obtained in two ways: by training inexperienced applicants, and by hiring men who have had previous experience in other plants. In the former case, preference

Fig. 2—Rotating rollers permit revolving of cylindrical work without crane service —Result, more continuous welding and lower costs.

is given to a high school graduate who has had some machine tool experience. It is only when the operator can butt weld two ½-in. plates, each vee'd to 30 deg., without objectionable inclusions, gas pockets or lack of penetration, and produce true fillet welds in both flat and vertical positions which shall have the required tensile and ductility properties of filler metal, that he is permitted to perform our more important welding operations. The time needed to acquire sufficient skill is from four to six months.

When a rush of work requires the employment of experienced welders, we advertise by personally passing the information of our requirements through employees or through the newspapers. When a welder applies, we ask him if he is willing to make a qualifying butt weld test. The nick-break test is made in the presence of the applicant, and if the work is of such a nature that our supervisor feels that with a little practice the applicant can perform the test successfully, he is allowed further tests. This method of qualifying an operator has been questioned many times with the statement that a nick-break test does not measure either tensile strength or ductility. We have found, through years of experience with tensile, bend, fatigue, impact, hardness tests, and metallographic investigations, that the nick-break test is by far the most difficult one to pass. Our judgment of an operator's ability from a nick-break test has not failed in over five years use, and too, this type of test can be made at practically no cost to the company, and of but one or two hours of the applicant's unemployed time.

Some of our operators have been qualified for welding unfired pressure vessels with plate thickness from ⅝ to 1½ in. These welders have built a large number of pressure vessels under the supervision of insurance companies.

EQUIPMENT—WELDING MACHINES—In view of the developments constantly being made in welding equipment, we believe five years is the extent of time a welding machine should be used. Not that the equipment is worn out in that period—we know of many welding machines which have been in continuous operation for 10 or 12 years—but that the developments perfected make it advisable to adopt this program. All our welding machines are depreciated over a period of five years and in turning them in on new equipment, no book loss is sustained.

It is our experience that d-c. welding machines are so sturdily built that little or no upkeep is necessary over the period they are kept in service in our shop. They are, however, periodically inspected by our electrical service men.

ELECTRODES—While we know that welds made with bare wire are satisfactory in many fabrications not subjected to high stress, we have ruled out such wire solely because of the possibility of it being used in structures where shock and high stresses will be encountered. The electrode cost is so small a part of the overall cost of welding that the added ductility secured by using heavily coated electrodes justifies the small extra expense. We carry in stock a wide range of electrodes from 5/32 to 5/16 in.

SET-UP TABLES — To facilitate welding, we provide a number of large heavy cast-iron tables having suitable bolt slots for set-up work and for clamping work preparatory to tacking. A number of lighter section tables are also available, which can be readily moved. These are used as supporting structures for jigs and fixtures. Tables are an indispensable facility for a properly constituted weldery. We also have several cast-iron floor plates set in concrete, which are used for setting up large structures.

SHEARS AND SAWS—GAS CUTTING—In the preparation of steel for welding, shears, and power or friction saws are required. Heavy sections unsuited for mechanical cutting are shaped with a gas torch. Even with light sections

a torch is necessary where contours vary from a straight line. In addition to the required number of hand torches, it is desirable to have one or more mechanically-operated gas cutting machines. The fixed type with pantograph motion and the two-directional travel carriage type are equally serviceable. In addition, at least one portable gas cutting machine to operate on a portable rail for straight line cutting, or on a radius arm for circle cutting, is of great service.

When a large number of gas cut parts is to be made, multiple-cutting torches can profitably be used on mechanically operated machines, thus materially reducing the labor cost per piece.

POSITIONING MACHINES — Today, no properly constituted weldery can afford to be without positioning machines. The larger machines, for large and heavy work, should be power operated. The smaller sizes may be hand operated. Fig. 1 illustrates a large type positioning machine designed and built in the author's plant.

A structure, once fastened to a positioning machine, can be quickly revolved into proper position for welding, thus eliminating the delays incident to desired setting with the use of a crane. In addition, "fast" electrodes can be used without danger of undercutting, and symmetrical fillets can be obtained. Savings in welding time of from 10% to 30% are regularly effected, and overhead cranes—no shop has enough of them in busy periods—are released for other work.

BENDING ROLLS—The shaping of cylindrical and conical structures is usually performed on power-driven bending rolls. We have, however, found a bending brake more advantageous for conical work, if the cone is composed of two or more longitudinal plates.

Fig. 3—Clamps, straps and bolts are handy to push and pull plates into alignment.

Our bending rolls are not heavy enough for some of the work we produce, and often it is necessary to have plates rolled in plants hundreds of miles away. We sometimes order plate from the mill, rolled to size before shipment to us.

ROLLERS, SPIDERS, AND CLAMPS—The use of rollers is advised for welding large cylindrical work. In Fig. 2 is shown a large water-cooled shell mounted on supporting rollers. Longitudinal and circumferential seams may both be welded in one setting, without continuous overhead crane service. Roller supports such as shown are low in cost as they consist only of channels tied together with plates and the necessary bushed rollers and supporting pins.

Two other methods for maintaining alignment of cylindrical and conical sections are used. In one case a spider with adjusting screws rounds the cylinder and maintains the true size during welding of the longitudinal seams. In another (See Fig. 3) adjusting straps and bolts are used to align the conical and cylindrical sections for welding.

PLATE BRAKES AND PRESSES—The extent to which proper tools for bending metal eliminate welding labor, is too little appreciated. Fig. 4 shows a brake with a capacity of 13 ft. 6 in. of ½-in. plate bending a ½ in. x 11 ft. 2¼-in. plate into a channel shape. Two strokes of this press eliminate 22½ ft. of ½-in. butt weld, which would be required if the design called for the welding of the detail with three plates. The saving in time and labor cost is obvious. Note that the brake is a completely welded structure.

Another type of power tool for bending material of heavier sections than can be handled on plate brakes is the hydraulic press. Not only is this tool useful on heavy work, but also on plate of lighter sections when bent edgewise.

WELDING FIXTURES — Unfortunately, in most welderies there is too little realization of the importance of welding fixtures as aids in reducing labor. Much thought and study should be given to the design of suitable fix-

Fig. 4—A plate bending brake is a profit producing tool in a weldery—One stroke eliminates 11 ft., 2¼ in. of weld in ½-in. plate.

tures for aligning metal to be welded, both from the standpoint of interchangeability of parts, and of reduction of cost.

Fixtures should be of sturdy construction so as to prevent distortion due to localized welding heats, and should provide means for quickly setting and clamping the various parts of the structure. Fig. 5 shows an example of an efficiently designed fixture. This fixture is designed so that it not only holds the various parts rigidly, but the lugs are held with spring steel snap rings which can be applied in but a few seconds. To position all these parts properly without a suitable fixture, would be almost impossible. With it, the entire assembly of 43 separate parts is made in less than 10 min.

HEAT TREATING FURNACES—There are certain classifications of work which demand special facilities and equipment which are unnecessary in other lines. If the main product of a weldery is Class 1 pressure vessels, facilities for thermal stress relief and heat treatment are essential. Every weldery has occasion to thermally stress relieve some portion of its products.

For heat treatment, a suitable furnace, either gas or oil fired, is needed. In almost all industrial localities, heat treating equipment is available as a commercial service to the trade, and if the quantity of work to be heat treated is not large, it may be best to depend upon other companies to do the work. We find that two oil fired furnaces, required for our forging and

Fig. 5—These two fixtures align 43 pieces and make possible interchangeability and low cost—Indispensable for production work.

plete welding. Details which require bosses made from rolled steel bars are generally much cheaper in finished cost when the bosses are cut off in lathes and rough bored in the same setting. In other cases, satisfactory results and lowered costs are made possible by doing the necessary machining before welding.

(This prize-winning paper will be concluded in December issue.)

flanging work, are a great advantage to us in heat treating certain of our welded products. At times we have much larger pieces to stress relieve than our furnaces will accommodate, and we send this work to a commercial heat treating company or to one of the large steel foundries in our district. For best results, the furnace should be equipped with a thermostat to control the temperature. With some large weldments, where grain refinement is desired, the heat treatment is done in pit annealers.

TESTING EQUIPMENT — Investigation and research have become necessary functions of a successful weldery. Whether a shop employs 1 or 100 welders, it is important to know the quality of an operator's work. To qualify a welder for code work, necessitates the use of a testing machine for determining the ultimate and yield points. The investment required to enable a weldery to do its own tensile testing would not be justified in a small shop, as testing laboratories are available whose charges are moderate. In large organizations, and particularly those where other tests are regularly called for, the cost of a tensile testing machine can be justified.

When research work is carried on, and a research department is maintained, other equipment such as fatigue, impact, and hardness testing machines, is used. Then, too, metallurgy has become so generally recognized as a science of importance to welding, that microscopes for study of grain structures have become a necessity.

MACHINING—While machining facilities are not essential to a weldery, and many successful ones operate without machine tools, there is a great commercial advantage in being able not only to fabricate welded equipment, but to make it. There are many instances in which a complicated structure may be handled best by building it in sections and machining certain parts before total assembly and com-

Weldability of Nickel-Alloy Steels Aids Fabrication

By J. W. SANDS*

★ In common with other alloy steels of the same group, most of the nickel steels of so-called S.A.E. grades are weldable by one or more of the usual commercial processes (metallic arc welding, gas welding, atomic hydrogen process, carbon arc welding) but some of these steels respond much more readily than others to the usual welding procedures.

For examples, as the carbon content and the proportions of alloying elements increase, alloy steels generally develop increased air-hardening tendencies and higher hardening capacities. The higher carbon alloy steels when welded harden appreciably in the heat-affected zones; hence avoidance of cracking and other difficulties requires pre-heating to reduce chilling effects, and strain-relieveing subsequent to welding, or both. For example, the maximum increase in hardness found in the heat-affected zones in welding an alloy steel with 0.20% carbon was only 25 Brinell units as compared with 300 units' increase in a 0.45% carbon steel of the same alloy content. Since it is known that hardening, to the extent found in the higher carbon of these two steels, is accompanied by volume changes which are responsible for the development of internal stresses, it is not difficult to see why cracking can occur either within the deposits or within the heat-affected zones.

It is generally better to select a steel with less than 0.20% carbon than one in which strength has been procured by higher carbon content. Many nickel alloy steels containing less than 0.20% carbon show 50% or larger increase in yield points. Such steels have a relatively mild hardening tendency and low hardening capacities. On the other hand, if the same increase in strength were obtained by increase in carbon content, without the aid of the nickel, the resulting steel would not be readily weldable.

Coated electrodes are to be preferred in most instances to bare wire, and frequency unalloyed electrodes may be used in the welding of nickel and other alloy steels, since the deposit will be improved by absorption and diffusion of the alloy from the base metal. Such practices have long been used in the construction of mobile ordnance equipment from plates and shapes of comparatively thin sections —around ¼ in. With increases in thickness, or where the retention of toughness at low temperatures may be a requirement, higher percentages of nickel must be incorporated into the deposits, and alloy steel electrodes may be required.

In the present stage of development the industry can be said to be in a position to furnish electrodes, covering a wide range of alloy contents, which have good flowing characteristics and which will deposit sound ductile metal. Better rods are being developed each year, although perhaps the greatest need at this time is for electrodes and coatings which may be classed as universal, i.e., those which may be used

*Development and Research Division, The International Nickel Co., New York City.

Table 1—Results of Tensile Tests on Low-Nickel Alloy Steels

Carbon, %	Weld Yield Point, psi.	Parent Metal Yield Point, psi.	Tensile Strength, psi.	Elong. %	Red. in Area, %	Location of Failure
0.08	57,000	.....	63,000	29	70	Parent metal
0.08	65,000	.....	69,000	26	66	Parent metal
0.08	.....	55,800	65,300	33	54	Parent metal
0.08	.....	55,800	65,900	34	56	Parent metal
0.22	85,600	72,000	95,400	27	42	Parent metal
0.22	85,200	66,300	91,800	27	44	Parent metal

Table 2—Effect of Stress Relieving on Plate and Weld Metal

Location of Test Piece	Condition	Tensile Strength, psi.	Yield Point, psi.	Elongation, %	Reduction in Area, %
Plate	As Rolled	81,000	52,300	28.0	59.0
Plate	Stress Relieved	78,800	.....	31.0	57.0
Weld Metal	As Welded	70,800	57,800	22.5	39.5
Weld Metal	Stress Relieved	67,800	51,500	32.5	60.5

when welding vertical and overhead positions.

The experiences gained industrially in the design, construction and utilization of high strength welded alloy steel in mobile ordnance equipment, pressure vessels, rail re-building operations, locomotive fireboxes, etc., have clearly shown that welding is not restricted to ordinary commercial carbon steels. This has been emphasized by the many successful applications in recent years of welded construction employing "high-tensile" nickel-copper alloy steels. These steels, of which there are several on the market, carry a low carbon content, depending on the alloy additions for their high tensile strength, ductility, good forming properties and improved resistance to corrosion. They have been widely used where weight saving is an important factor as in such mobile equipment as tank trucks, railroad rolling stock, power showels, grab buckets, etc. Railroad parlor cars, of welded steel construction, built of nickel-copper steel saved about 30,000 lbs. in weight per car.

Indicative of the properties obtainable in welded joints of such a steel is the following compilation (Table 1) representing arc welded joints in as rolled plate containing approximately 2% nickel and 1% copper with carbon as indicated: No stress relieving or other heat treatment was employed.

Frequently the use of welded nickel alloy steels is desirable for other reasons than improved strength and corrosion resistance. Maintenance of good toughness or resistance to embrittlement at low temperatures is often a requirement, as, for example, in pressure vessels used for propane dewaxing which operate at temperatures down to —75 deg. F. Carbon steels tend to become quite brittle at such temperatures, but additions of nickel are effective in minimizing this effect. As a result of tests several large vessels were built using steel containing 0.25% carbon, 2.25% nickel and 0.65% manganese.

Low carbon 3% nickel steels have been used for welded pressure vessels operating at temperatures as low as that of liquid air (—300 deg. F.) at pressures as high as 400 lbs. per square inch. The following data (Table 2) represent averages on welded plates 5/16 to ¾ in. thick containing 3% nickel as reported by a leading fabricator of such vessels. All of the pressure vessels made of this steel passed all of the tests prescribed by the A.S.M.E. Class I welding code governing the construction of welded pressure vessels.

Many other examples could be mentioned and there are many additional data available which cannot be touched on here due to space limitations. Much of this has been summarized in "Welding Nickel Steels—a Review of the Literature to July, 1937" by Spraragen and Claussen in the May, 1938, report of the Welding Research Committee of the Engineering Foundation (Vol. III, No. 5).

The current year witnessed continued expansion and diversification of the use of alloys containing nickel, an increasingly large number of parts of machinery equipment of all types now being fabricated from a variety of alloys of which nickel is an influential constituent.

Recent trends include increasing consumption of stainless steels, expanding use of nickel-molybdenum steels for highly stressed parts, and of nickel cast-irons for pressure components and parts subject to heat, abrasion, wear and corrosion.

Expansion in the use of nickel-bearing stainless steels of the 18-8 type was noteworthy particularly in view of the low level of steel operations. Substantial progress was also made in extending the applications of low-alloy high-tensile corrosion resistant steels of the nickel copper alloy type. Most steels of this type are marketed by steel manufacturers as proprietary products.

Among the non-ferrous developments of importance during the past 12 months has been the development of Z nickel, a heat-treatable alloy containing 98 per cent pure nickel which, in certain forms, has been produced with a tensile strength as high as 250,000 psi. and hardness values up to 46 Rockwell C. The alloy retains all the corrosion resistance and other properties of nickel.

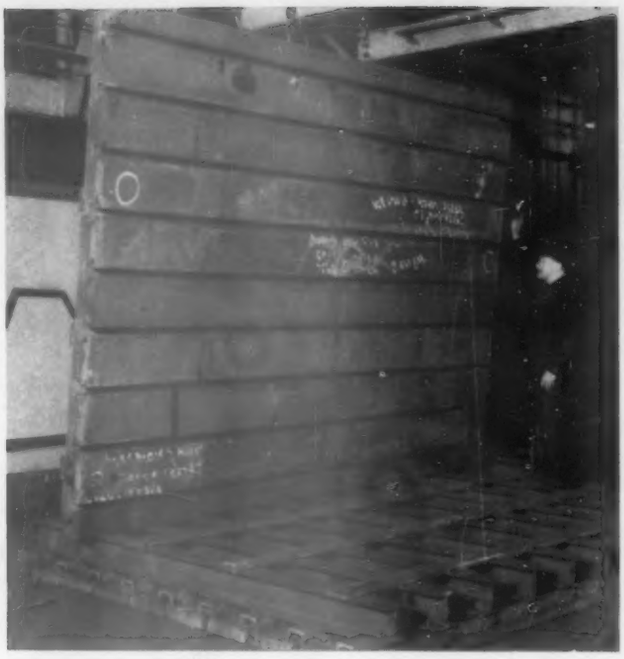
Of interest, also, has been the increased use of Inconel exhaust manifolds and cabin heaters. Practically all of the big new planes built or projected within recent months are equipped, or will be equipped, with such parts made of this high nickel-chromium alloy which has been found exceptionally successful in resisting the heat and corrosion encountered in this service.

Advances have been recorded in the fields of clad metals. Inconel-clad steel has become an important factor. A recently introduced companion to nickel-clad steel, it has been found useful where the relatively low cost of steel construction is desired with the corrosion resistance and other properties of Inconel. Perfection of a method for cladding rolls of steel, iron, bronze, aluminum and other materials with nickel, Monel and Inconel has lead during the past year to the solution of many roll problems in the pulp, paper, textile and associated industries.

Since alloys containing nickel are used primarily where greater strength and toughness or greater resistance to heat, corrosion, wear or abrasion are desired, progress inevitably reflects the development of trends previously established rather than a series of spectacular innovations.

» «

THE NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS has issued a public call for (1) information concerning new industrial or occupational eye hazards—both accident and disease hazards (2) recent and significant statistics concerning any occupational hazards to sight—showing frequency, severity, causes, nature of injury, degree of impairment, cost, etc., (3) photographs showing either hazards to sight or protection against such hazards and—most important of all—(4) information concerning successful methods of eliminating, counteracting or alleviating the disease and accident hazards to eyes. The Society's headquarters are at 50 West 50th St., New York City.



Huge welded floor plates for use in testing heavy equipment—Photo, courtesy of Westinghouse Electric & Mfg. Co.

Seventh of a series of practical articles on

Technique of Arc Welding

★ Procedure for making vertical fillet welds—How to make horizontal butt welds on plates in vertical position

By ROY OWENS
Welding Instructor, Electro-Motive Corp., La Grange, Ill.

FIGURE 38 shows a 3 pass fillet weld put in vertically and is a combination of motions for making a large fillet weld in an inside corner on heavy sections. First pass *A* is put in using ⅛ in. or 5/32 in. electrode and a vertically oscillating motion described in the August issue (Fig. 31). All slag and scale should be removed before starting second pass *B*. This motion is same as shown in Fig. 32. Sizes of electrode for best results are 5/32 in. or 3/16 in. Larger sized electrodes will be more difficult to handle with this motion.

Before starting pass *C* slag and scale should again be completely removed. This third pass is a straight-across motion and is carried up slightly on each stroke across and will make a very even surface approximately straight across from one edge of weld to other. Sizes of electrodes for third pass, *C* are 3/16 in. or 7/32 in. for best results. Current should be increased accordingly.

Figure 39 shows an extra heavy weld approximately 1½ in. across face of weld using a ¼ in. electrode. With this one-pass vertical motion, slag pockets are very probable and every precaution should be taken to guard against them. To lessen the chances of slag pockets, the weld should be kept built up at a slant to allow the slag to flow back over the outside of crater. The inside corner (indicated by arrow) should be kept built up about ¼ in. above the outer part. It will be beneficial if the operator uses as hot an arc as possible, as the higher the slag is heated, the thinner it will be and it will flow off of the weld with just a small pitch. Heavy heats will insure better fusion and penetration. This

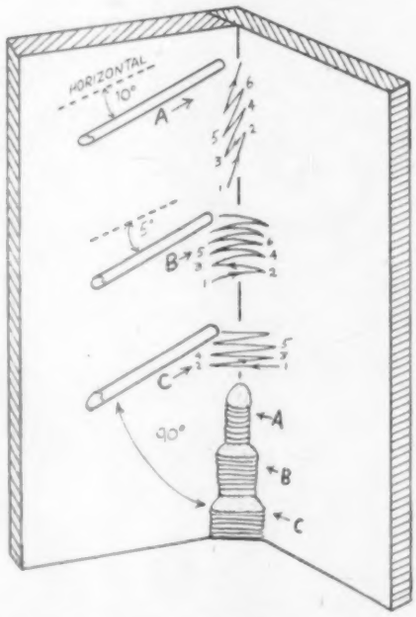


Fig. 38—A 3-pass vertical fillet weld for inside corner on heavy sections

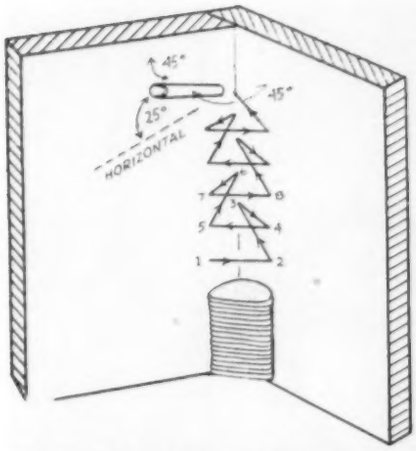


Fig. 39—A single-pass vertical fillet weld where a large filling is needed on heavy work —Precautions must be observed to guard against slag inclusions.

type of weld gives best results when used on heavy sections (one inch and over). Lighter thicknesses cannot absorb the heavy heats as rapidly and due to the heavy filling, more time will be required to make a weld. The parent metals will become somewhat overheated and this will make it more difficult for the operator to keep the added metal in place.

Should Be Stress Relieved

Welds of this type should be normalized, if possible, as a large weld put in with one pass will have a tremendous amount of locked up stress in the weld. With changes of temperature and mechanical vibration a fatigue failure is probable. From position *1* to *2* the arc is carried across the outside part of the weld and from *2* to *3* the arc is carried into the corner. At *3* there should be a slight hesitation to allow the arc to burn into the corner thoroughly and from *3* the arc is drawn back down along the side to *4* and then carried across the outside to fill the outer part of weld *5*. The motion is then repeated same as from *2* to *3* and *3* to *4*. The electrode should be held about 25 deg. above horizontal and slanted downward to keep the crater molten.

Figure 40 shows a butt weld made horizontal on vertical plates with only the upper piece beveled, which makes a half-vee'd groove of 30 deg. to be filled in and therefore much easier to weld in a horizontal position than if both pieces were beveled to 30 deg. By leaving the bottom piece square it will act as a shelf to hold the molten metal in place and make it possible for higher heats to be used without having a heavy deposit along the lower edge of the weld or undercut on upper edge of weld. This will require only about one-half the amount of time and filler metal and will be less difficult to keep the molten metal in place. This type of joint is not used extensively except where the surface has to be kept even. This joint is recommended for good penetration and neatness.

If the correct heat is used penetration will exceed 90% of material thickness with a single-pass weld up to ¾ in. thick. Material heavier than ¾ in. should have a stringer weld put in first to insure maximum penetration and fusion in bottom of the vee. The motion shown in Fig. 40 is an oscillating, back-and-forth motion with a slight curve going from *1* to *2*. From *2* to *3* the arc is carried forward at approximately the same slant and ahead of previous stroke, but at this point the arc should be carried into the bottom of vee with a very short arc to prevent non-fusion at the bottom. The electrode should be held 15 deg. ahead of weld and approximately 70 deg. from vertical plate. (See Fig. 40.)

On small welds a short stroke can be used but on larger welds the stroke should be lengthened so that the crater is kept almost at a horizontal position. Also, when a larger electrode is used, the current must be increased and the long stroke will spread the heat over a larger area, thus preventing the molten metal from spilling over the edge of crater or leaving a heavy ridge of metal at the lower side of weld.

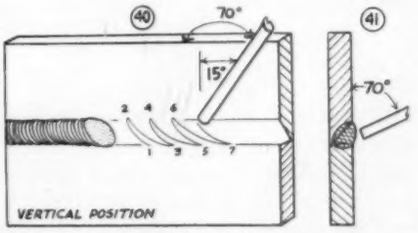


Fig. 40—Horizontal butt weld on vertical plates, upper plate only is beveled.

Fig. 41—End view of same joint.

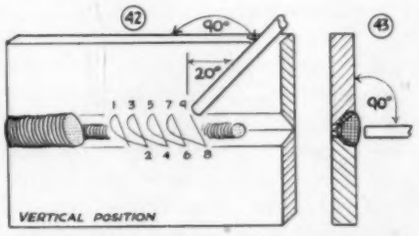


Fig. 42—Horizontal butt weld on vertical plates, both plates beveled—60-deg. included angle.

Fig. 43—End view of same joint.

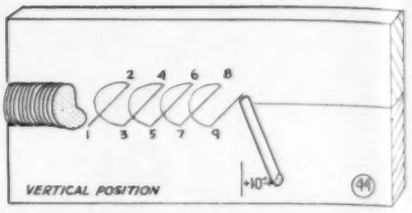


Fig. 44—Horizontal butt weld on vertical plates, no bevel being used—Suggested only for bare electrodes.

On the large weld the upper side will not fill in as easily and caution must be taken on the back stroke to see that it is carried back far enough to insure a full and complete surface weld. A smaller size of electrode should be used for welds of this type than for the same size of weld in other positions.

Figure 41 shows an end view of the joint and indicates how the weld should look when finished. It also shows correct position for the electrode.

Figure 42 is a butt weld similar to Fig. 40 with the exception that each piece is beveled to a 30-deg. angle and when the two are brought together it makes a 60-deg. vee to weld. A stringer weld should be put in as first pass to fuse bottom of vee and to fill out the deepest part of vee so that second pass will not require an extra heavy filling to complete the weld. A heavy filling would be very difficult to keep in place. This weld is not recommended for high pressure work, but is more or less used for structural work or where the finish is of major importance.

The electrode (Fig. 42) is slanted 20 deg. ahead of weld and 90 deg. from vertical surface. The current for a given size of electrode will be below average. The reason for the low heat is to have just enough heat to keep the filler metal at a plastic stage, thus resulting in a neater appearing weld. With this motion the filler metal is deposited on the downward stroke from *1* to *2*, and from *2* to *3* the arc is carried up quickly and no metal is deposited. However at *3* there should be a slight hesitation to allow the arc to bring parent metal to a fusion stage before starting down from *3* to *4*. The stroke *3* to *4* is a half circle and is carried out at bottom of stroke to build a shelf to hold metal. As the electrode nears the end of the down stroke it should be moved faster so that the deposit will be thinner at the bottom, and blend into parent metal with a feather edge.

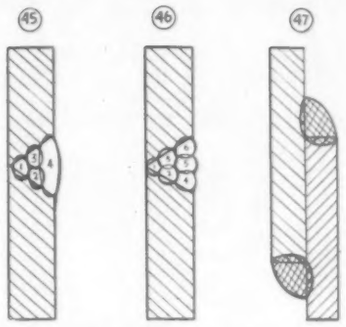


Fig. 45—Multiple-pass vee'd butt weld made in horizontal position.

Fig. 46—Same type of butt weld using stringer beads to complete the weld.

Fig. 47—Lap welds made in the horizontal position.

Figure 43 is end view showing how the two passes should appear looking at them from the end. It shows the correct position of the electrode.

Figure 44 shows a motion that is good for a surface weld with bare electrodes, but with extruded electrodes trouble may be encountered with slag inclusions. This weld will not penetrate to a great depth but can be made to have a very good appearance. The motion is similar to the motion shown in Fig. 42 except that upper side of weld is kept built out in advance of the lower side. The arc is carried up at a slant ahead of weld as shown on stroke *1* to *2* and then from *2* to *3* it has a half circle. On this stroke the metal is deposited as previously described for Fig. 42. The upward stroke is carried up quickly and no metal is deposited. The electrode is held 10 deg. ahead of weld and 90 deg. from vertical surface.

Fig. 45 is a vee butt weld made in a horizontal position. The first three passes are put in with stringer beads, or as many passes as necessary to fill the vee out to the desired point. Then the fourth pass is put in using the motion shown in Fig. 42, which covers all previous beads and gives the appearance of a one-pass weld. This is used where the weld is not to be ground or finished after welding.

Figure 46 is similar to the previous weld, but stringer beads are used to complete the weld. After each bead is put in a complete cleaning job should be done before the next bead is started to eliminate any interference with slag. It is said that welds put in with more than one pass generally give greater ductility and a finer grain structure. Each succeeding weld anneals and stress relieves the metal previously deposited.

Figure 47 is a lap joint and is probably used somewhat more than the butt weld. This joint will require an overhead fillet on the bottom weld and a down-hand fillet on the top weld. If a butt weld can possibly be used it will represent a substantial saving in metal.

» «

Welded Steel Construction—For the Structural Detailer

★ Structural welding has long since passed the experimental stage and appears to be on the threshold of a period of intense development. A step in this direction has been taken with the publication of a very practical book designed primarily for the structural engineer, detailer and estimator. "Welded Steel Construction" by Robert S. Hale is intended to be a working manual and drafting board "bible" for the man who must design and prepare detailed drawings of welded connections. In his first chapter the author presents 23 valid reasons why welded steel construction possesses advantages over other methods of fabrication. Truly, an imposing list.

By scanning the table of contents, reproduced in part below, it will be apparent that Mr. Hale's new book should be very helpful to the designer:

Chapter I—Review and Reasons for Using Welded Steel Construction

Chapter II—Principles of Welding

Chapter III—Design

Chapter IV—Application of Design Principles

Chapter V—Drawings and Details

Chapter VI—Estimating Structural Steel Costs

Chapter VII—Fabrication and Erection

Chapter VIII—Inspection and Testing

Chapter IX—Conclusions from Experience

Appendix A—American Welding Society's Drawing Symbols

Appendix B—Ready Reference Tables and Graphs

Appendix C—New York City's Building Code 1938 (welding portion)

Appendix D—Chicago, Ill., Building Code (welding portion)

Appendix E—American Welding Society's Specifications for Highway and Railway Bridges by Fusion Welding (parts of) 1936

A well arranged index is included for quick reference.

Only enough space is given to welding fundamentals to give the designer some degree of familiarity with the more common welding terms, types of joints, etc. Here are the author's conclusions regarding the outlook in this field (Chapter 9):

"1. Structural welding has passed the experimental stage and is now in the era of development.

"2. Confidence is here. Large cities recognize welding in their building codes.

"3. Interest in the subject is intense.

"4. Welded jobs are increasingly numerous.

"5. Structural welding should be in experienced hands for the design, detailing, fabrication and erecting of welded steel structures. Public safety is all-important.

"6. Costs of welded structures are being reduced and favorable bids can now be received in competition with other methods.

"7. Inspection is becoming standardized.

"8. Education of structural engineers, shop detailers, architects, and builders is needed. This book should be helpful in furthering such education."

The author is a practicing structural engineer who has become greatly interested in welding and its applications in the structural field. Book has 170 pages, 5½ by 8½, trim size, cloth bound, priced at $3.00. Publisher—Pitman Publishing Corp., New York and Chicago.

» «

British Welding Research

Addressing a meeting of the British Institute of Welding in Manchester recently, Sir William Larke, the president, said that last year had witnessed not only a great extension in the applications of welding throughout the United Kingdom, but an increasing demand on the part of users for still wider applications. The Institute, through its very active organization, is working on all problems connected with the development of welding and, with this object in view, it has set up in addition to the main research committee, five principal committees and 12 subcommittees, to each of which has been allocated the investigation of a separate phase of the problems involved.

President Larke added that, in cooperation with the shipbuilding and engineering institutions, the classification societies, the Shipbuilders' Conference, the steel manufacturers, and others, a special testing machine had been devised. It is being set up in Scotland in order to ascertain the soundest, lightest, and most economical method of welded construction from standpoint of equivalent efficency and strength of riveted bulkhead stiffeners, deck beams and girders, steel framing, etc., as laid down in existing rules.

The results obtained will, it is hoped, enable new rules to be drawn up. In the structural field, the new regulations which the London County Council has established as a result of collaboration between the technical officers and the Institute, have increased the stress on welded structures to 16,000 psi. A new authoritative handbook on arc welding procedure is about to be published.

New Product Developments

Oxweld Type CW-23 Cutting Attachment

★ A new cutting attachment has been developed which has a number of advantages over earlier types of attachments. It is characterized by its unusual stability of preheating flames and superior flashback resistance. Known as the Oxweld (Type CW-23) cutting attachment, it will cut steel as thick as 8 in., and will operate on either low- or medium-pressure acetylene.

The CW-23 is an important accessory to the W-17 and the W-22 Oxweld welding blowpipes since it extends the usefulness of either blowpipe by adapting it for cutting steel, wrought iron, and cast iron. The addition of this cutting attachment to one of these blowpipes produces an ideal equipment assembly for shops where the amount of cutting does not justify the purchase of a separate cutting blowpipe.

Superior flashback resistance is an important feature of the Oxweld (Type CW-23) cutting attachment.

Operations like the mitering of pipe and the beveling of edges for welding are possible merely by putting on the cutting attachment in place of the welding head. This change, made with the same motions as those for changing welding heads, can be accomplished in less than a minute and without requiring the operator to move from his work.

The CW-23 will cut any thickness of steel up to 8 in. and, within its range, it will operate at speeds and efficiencies equal to those of a full-sized cutting blowpipe. The CW-23 will cut equally well with either low-pressure or medium-pressure acetylene without requiring any change of mixer or any other alteration or adjustment.

Because of its control of the gases in combustion, the CW-23 is a distinct improvement over earlier cutting attachments. The injector, which is in the lowest tube of the attachment, is so proportioned to the surrounding chamber that it provides the desired mixing action with either low-pressure or medium-pressure acetylene and, at the same time, assures the necessary volume of acetylene even from a low-pressure source.

The acetylene flows in a circuit from the valve body to the head and then back to the injector, where it mixes with the preheating oxygen. This long acetylene passage and the close tolerance between the injector and surrounding parts assure a stable preheating flame and the proper nozzle velocity of mixed gases. This also provides a smooth flow of oxygen and acetylene in the normal direction and helps prevent the gases burning back of the nozzle tip.

An illustrated folder describing the Oxweld (Type CW-23) cutting attachment in detail may be obtained by writing to the nearest office of The Linde Air Products Co.

» «

General Electric A-C. Arc Welder for Light-Gage Work

★ A new 150-amp. alternating-current arc welder of the transformer type has been developed by General Electric for low current welding with heavily-coated a-c. arc welding electrodes. While it is chiefly intended for use on light-gage metals, it is said its wide welding range—35 to 180 amp.—permits its use on fairly heavy materials as well.

It is claimed that with this type of equipment, power costs are reduced approximately 50 per cent. In addition, it avoids troublesome arc blow, sometimes experienced with direct-current welders, thus reducing the number of rejects to a considerable extent and avoiding the necessity of reworking welds.

New transformer type a-c. welder has current range from 35 to 180 amp. Open-circuit voltage is either 80 or 100 volts.

The new equipment is built with woven, spun-glass, fireproof insulation which prevents damage from heat on heavy overloads. Solidly brazed internal connections eliminate the possibility of open circuits. Continuous, stepless current control is obtainable by means of a hand-crank. This arrangement gives accurate adjustment of the welding current to suit fine work. Adjustment can be obtained at any time without interrupting the arc or opening any electrical connections.

A choice of two open-circuit voltages (80 and 100 volts) is provided to handle all types of a-c. electrodes. The welding lead can be quickly and easily connected to either tap by means of a taper-bored connector. A circular cover plate over the terminals prevents chance contact with the terminal (or terminals) not being used. Easy portability is provided by casters or by means of a hoist sling over the hand-crank.

The equipment meets the requirements of the latest standards of Underwriters' Laboratories, Inc., and is listed under their Re-examination Service.

» «

New Murex Electrode for Fillet Welding

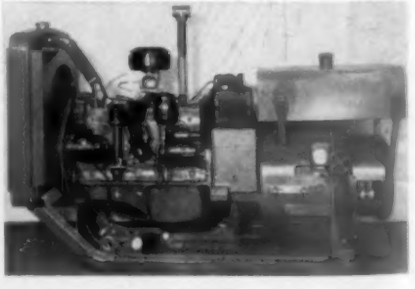
★ Metal & Thermit Corp., 120 Broadway, New York City, announces an addition to its line of Murex heavy-coated electrodes for manual arc welding. The new electrode, known as Murex Fillex, is designed for fillet welding and other down-hand work. Welds made with this electrode have physical properties meeting the American Welding Society's specifications for Grade 10 Filler Metal. Au outstanding feature, it is claimed, is low cost of deposited metal. Used at unusually high amperages, it is said that Fillex will not undercut and will permit welding operators to increase output appreciably. Descriptive literature is available upon request.

» «

Engine Driven Welder

★ A new welding unit for field and rural service where power supply is not available has been designed by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The Flex-Arc Model SFA 200-amp. gas engine driven welder is completely equipped with governor, hydraulic idling device, current indicator, polarity reversing switch, oil filter and is equipped for battery starting. It is said to be lighter in weight and compact in size. No meters, rheostats, reactors or other "gadgets" which require frequent maintenance are used.

The welding generator is said to vary the current output by means of a magnetic shunt in the armature reaction flux path, while the current output adjustment is mechanical. A handwheel on the side of the generator is turned for adjustment to any desired current setting which is easily and clearly read on a calibrated dial mounted behind a glass window inside the generator frame.



Flex-Arc Model SFA 200-amp. gas engine driven welder for portable service.

The power unit, a model T50 Chrysler industrial engine, is claimed to be exceptionally reliable and economical with fuel consumption of only 2 gal. per hour when the set is operated continuously on a 200-amp. load. A down-draft carburetor provides power with great economy under varying load conditions. Four main bearings insure permanent crankshaft alignment and eliminate vibration. Ample cooling capacity is provided by a sturdy radiator of standard construction.

» «

General Electric Announces New 150-Amp. D-c. Arc Welder

★ A new 150-am. d-c., single-operator arc-welder has been announced by General Electrim Co. for light-gage work. The new equipment, because of its high, instantaneous recovery of voltage, is said to prevent arc pop-outs at all points in its wide welding range with any good bare, lightly-coated, or heavily-coated electrode. Its stability prevents excessive current surges, thus avoiding excessive spatter loss and sticking of the electrode.

General Electric 150 amp. d-c. arc welder has range from 20 to 200 amp. at 25 volts. Extreme stability is claimed, preventing current surges.

Any welding current within its entire range can be quickly obtained by means of a three-point selector switch and an easily operated dial for intermediate adjustment. Additional assurance of dependable operation, is is claimed, is provided by a reliable means of self-excitation. Isothermic overload protection permits the equipment to carry maximum safe overloads without danger of burnouts and without unnecessary interruptions on harmless overloads.

The new d-c. equipment is rated 150-amp. at 25 volts and its range of adjustment varies from 20 to 200 amp. at 25 volts.

» «

Automatic Welding Head Has Two-Motor Differential Control

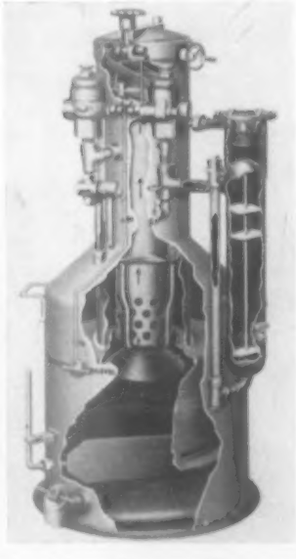
★ Una Welding, Inc., working with engineers of The Ohio Electric Co., both of Cleveland, Ohio, have developed what is claimed to be an exceptionally accurate and sensitive electrode feed control on the Una automatic arc welding heads. The control system uses two motors, the larger of which, a separately-excited d-c. unit, tends to feed the electrode down against the work, while the second, a constant-speed a-c. motor tends to feed the electrode down against the work while the second, a constant-speed a-c. motor tends to pull it upwards. The two units are geared together by a differential on the feed mechanism shaft so that the electrode is moved up or down according to the difference in speed of the two motors. The "down" motor is connected between the electrode and the work and the "up" motor is controlled by a relay in series with the welding current. A rectifier can be used where alternating current is used.

On starting the control the "down" motor receives the full open-circuit welding voltage (cut down by means of tapped resistances to 20-40 volts) and starts feeding the electrode until it touches the work when it is practically short-circuited and is de-energized. Expessive current flow is prevented by a series rheostat used in pre-setting the arc length. With the contact of the electrode with the work the welding current is established, energizing the relay which starts the "up" motor pulling the electrode away from the work, thus striking the arc. Both motors continue to run, the rate of electrode feed being directly proportional to the arc voltage and to the rate at which the rod is consumed. It is claimed that the control thus takes care automatically of any irregularities in welding conditions which may occur as work progresses. The motors are designed for low starting current, prompt response to changes in welding conditions and to conform to close speed limits for any given voltage.

» «

Portable Medium Pressure Acetylene Generator

★ A portable acetylene generator embodying a number of improvements has been developed by The Linde Air Products Co., 205 East 42nd St., New York City. The new unit is known as the Carbic medium-pressure acetylene generator, Type CMP-2. This generator has all the advantages of the former CMP-1, taking eight cakes of Carbic processed carbide at a single charge, and producing approximately 80 cu. ft. of acetylene from one charging. Recharging is quick and easy. The generator is compact and can be moved from one location to another without difficulty.



The Carbic medium-pressure acetylene generator (Type CMP-2).

Acetylene is always available at the turn of a valve until the charge is exhausted. Two relief valves are provided. There are no delicate parts to get out of order, and repairs are seldom required, it is stated.

A feature of the generator is the rubber sealing cone which seals off the cake holder from the water shell when the generator is not in use, thereby protecting the cakes of Carbic processed carbide from moisture. It is claimed this reduces to a minimum the possibility of pressure being built up in the generator due to after-generation.

The sealing cone seats against a moisture sealing ring at the bottom of the generating chamber. It is actuated by the operating handle of the generator. Springs automatically raise the cone upward to the sealing position when the operating handle latch is released and the operating handle allowed to move above the latch.

For further information regarding this new generator, write to the nearest office of The Linde Air Products Co.

» «

Black & Decker Announces New "Holgun" Drill

★ The Black & Decker Mfg. Co., 753 Pennsylvania Ave., Towson, Md., announces the "Holgun," a new pistol grip drill well balanced, compact tool with ample power. Anti-friction bearings are used throughout to deliver power to the spindle which is of heat-treated alloy steel. Ventilation is provided by three screened inlets any two of which are said to provide ample cooling. The pistol grip and trigger switch adapts this tool for ease of control by either right or left-hand operators. Construction and assembly are simple to provide easy access to any part for inspection and servicing.

New "Holgun" is a pistol-grip drill with capacity in steel up to ¼ in.

Capacity in steel is ¼-in., with no-load speed of 1700 r.p.m. Net weight is 2¾ lbs. with an overall length of 6¾ in. The universal motor operates on either a-c. or d-c. Catalog sheet giving detailed information is available from the manufacturer.

New "Prest-O-Lite" Outfit for Body Soldering

★ A Prest-O-Lite outfit, designed for use with welding size acetylene cylinders or generators, and developed primarily for automobile body soldering operations, is announced by The Linde Air Products Co., 205 E. 42nd St., New York City.

Known as the Prest-O-Lite body soldering outfit (No. 04P30), it is similar to the Prest-O-Lite 5-in-1 outfit with the exception that it has a torch handle with a needle

"Prest-O-Lite" body soldering outfit.

valve, a standard size acetylene hose connection and nipple, a Y adaptor, and 25-ft. of ¼-in. hose. Four different size stems are included for fine, light, medium and heavy soldering, and for brazing and heating. Also included is an enclosed-flame soldering copper for work in confined places where an open flame might damage adjacent materials. The unit makes it possible to use the standard type acetylene cylinders for air-acetylene soldering operations.

Further information regarding this new outfit may be obtained from the nearest office of The Linde Air Products Co.

» «

"Softweld" Electrode for Cast Iron

★ A heavily coated shielded arc electrode designed for depositing a soft machineable alloy on cast iron has been developed by Lincoln Electric Co., Cleveland, Ohio.

The new electrode is intended for correcting machining errors, filling up defects, for producing a very soft machineable drillable weld, in grey cast iron. Size—5/32 in. x 16 in.—Polished at the end.

The coating on this wire (a non-ferrous alloy) is designed so as to cause the weld to flow over and bond to the cast-iron with a minimum of penetration or heating of the base metal. Softweld operates best with d-c. negative polarity, although a-c. may be used. While a single layer deposit will be machineable in the weld metal, at least two layers should be deposited in order to obtain a soft fusion zone. The entire weld area may then be machined, sawed, drilled and tapped without any difficulty.

Current should be just high enough to obtain the necessary bond. In welding with this electrode it is recommended that the operator hold a fairly long arc (approximately ⅛ in.) weaving the electrode slightly from side to side. An average of 90 amps. and 18 volts at the arc will generally be found satisfactory.

Size	Current Range	Arc Voltage
5/32"	70 - 130 amps.	16 - 20

Since localized heating of cast-iron may cause it to crack, care should be taken to keep the casting from getting too hot. Weld intermittently if necessary. Short beads (2 to 3 in.) are preferable. Peen each bead after depositing. The very small amount of slag left on the bead may then be brushed off with a wire brush.

When correcting machining errors or filling up sand holes or depressions, it is good practice to prepare the work (by chipping machining or grinding) so that the final machined surface will be ⅛ in. or more above the base of the bottom layer of weld metal. Where there is a large or deep area to be filled or where a strength weld is required, an economical way to do the job is to use Ferroweld up to within approximately ⅛ in. of the surface to be machined and then finish off with a couple of layers of Softweld.

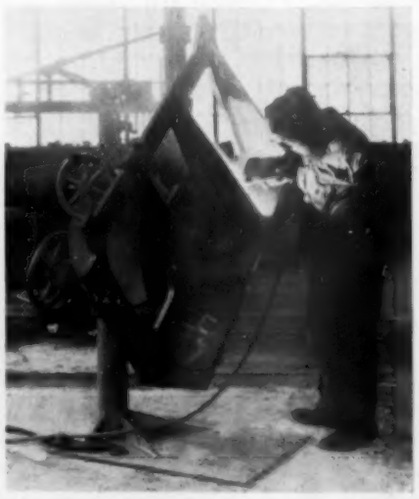
» «

Simple Welding Positioner

★ A newly designed welding positioner allows the operator to weld on all sides, top and bottom of a structure with only one set-up. Table can be tilted a total of 135 deg. from horizontal, so all welds can be made in a horizontal trough. In addition the table can be revolved through a full circle regardless of angular position at which it is tilted. Revolving and tilting is done by means of a separate hand wheel for each operation.

Gears for revolving and tilting are self-locking in all positions. The gears for revolving the table can be disengaged and the table revolved freely. This is advantageous for light bulky structures and circular work, because the welder can easily control rotation from his working position. An important feature of this positioner is that structures can be welded on both top and bottom, in addition to all sides without changing the original set-up.

The base of the positioner is 30 in. by 39 in. and sets flat on the floor, allowing operator to walk freely about work without interference from large or bulky underframe. Positioner can be readily transported about plant. Height of positioner is adjustable from 36 in. minimum to 48 in. maximum.



Simple hand-operated welding positioner.

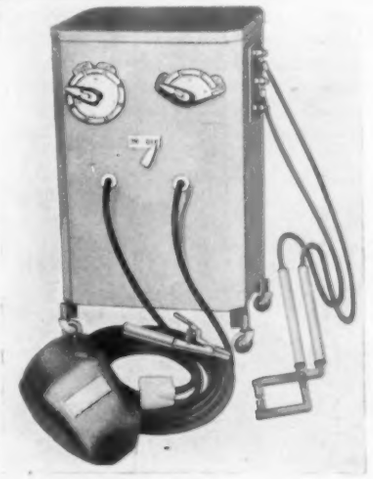
The unit is furnished with a head to which can be bolted special tables or fixtures suitable for various jobs. Capacity is 2500 lbs. with center of gravity of load 6 in. from table.

Cullen-Friestedt Co., 1302 So. Kilbourn Ave., Chicago, the manufacturer, will gladly supply any additional information which may be desired.

» «

Combination Unit for Arc and Spot Welding

★ A combination arc and spot welder, illustrated here, is announced by Miller Electric Mfg. Co., Appleton, Wis., as an addition to its present line of arc welders. The spot welder is built into the regular No. 2, and No. 3 welders, with capacities of 165 amp. for the No. 2 and 220 amp. for the No. 3.



Miller combination arc and spot welder.

These units are designed to provide arc welders of ample capacity to handle electrodes from 1/16 in. to ¼ in. They have 32 heat controls, enabling the operator to weld from light to heavy metal. With the addition of the spot welder the unit will handle all kinds of sheet metal work. The spot welder also has a number of heat controls for different thicknesses of metal. Special spot welding tongs, shown with the welder, are made in different styles to handle individual applications. It is stated that this new welder is patented in the United States.

» «

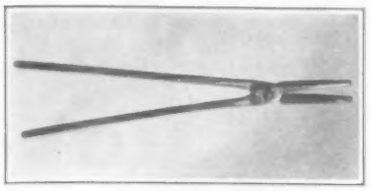
Flexarc Welding Cable

★ A Flexarc welding cable, that is flexible, durable, light in weight and has positive insulation, applicable for field and shop use, is announced by Westinghouse Electric & Mfg. Co. These cables comply in all respects with latest I.P.C.E.A. specifications for rubber-sheathed arc-welding cables.

The paper separator between the copper and rubber sheathing, permits sliding action between the outside layer of wires and the rubber jacket. Also, the large number of fine copper wires composing the stranding provide for extreme flexibility. The protective jackets of these cables are of 60% rubber armor, built for hard usage.

New Welding Tong

★ The Wiese Co. of Perry, Iowa, announces a new tong for welders, designed for both electric and oxy-acetylene welding. This tong is light in weight (1 lb.), length overall 17 in., and length of jaws 3½ in. This tong



New light-weight welding tong.

is designed to fill a much needed want in every welding shop and also in industries where this type of tool is needed. Literature can be obtained by writing to the Wiese Co., Perry, Iowa. This new tong will be marketed through local jobbers.

» «

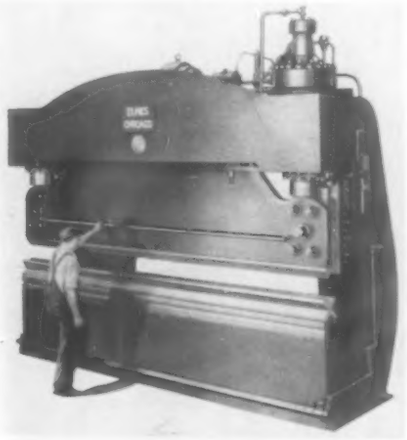
New Hydraulic Bending Brake

★ The Charles F. Elmes Engineering Works, 230 No. Morgan St., Chicago, has developed a new hydraulic bending brake which affords economy, simplicity, faster production, greater safety, and other operating advantages. With the hydraulic type of brake it is said to be impossible to damage the machine by attempting to handle work beyond its capacity. The brake will come down on the work, build up to its maximum rated pressure, at which time an automatic well valve opens, allowing the excess pressure to be returned to the oil reservoir.

It is unnecessary to make stroke adjustments for handling varying thicknesses of material, since the bending beam continues in its downward motion as long as the operator depresses the foot pedal. Release of the foot pedal immediately reverses the movement of the bending beam, returning it to its normal position.

The bending beam travels to the work at a rapid advance speed, automatically slowing down for the actual bending or forming operation thereby giving the operator a chance to check the location of the piece and angle of the bend. Movement of the bending beam can be stopped and held at any predetermined point by the operator while he checks his progress. The return movement of the beam is under fast traverse. The travel of the two pistons which force the bending downward is so equalized that it remains constant, regardless of eccentric loading. This equalizing feature (patent applied for) permits the forming or bending to be done at any point on the bed.

This brake has among its desirable features, greater depth of throat and opening than is customary in this type of machine. Its construction consists of welded steel housings, bed and beam, in which are mounted standard hydraulic units. This type of construction makes it possible to furnish practically any size or capacity of brake that may be required.



Elmes hydraulic bending brake is made of welded plates.

» «

1939 Model Alternarc

★ The new alternarc machine, Type W (1939 model), compensates the current and voltage for constant heat according to its maker, the Electric Arc Cutting & Welding Co., Newark, N. J. It is said this machine gives infinite variation of current and voltage with the proper voltage supplied for each current, automatically.

This is accomplished by sliding a portion of the core of the transformer welder in and out, so as to divert the flux from the "teaser" or control coil. Low voltage is provided for heavy current and high voltage for light current and automatically the current and voltage changes for every interpolation between the extremes of the welding range. This is claimed to represent a saving in power demand. With automatic machines the voltage is fixed. Heavy current increases the power in direct ratio to the amount of current.

With the new Alternarc constant energy machine as much as 50% demand charge can be saved it is claimed. The constant heat makes welding smooth and reliable. Meters are provided on the machine to show its operation and its NEMA rated capacity.

» «

Super-Feed Portable Automatic Acetylene Generator

★ Guthrie Mfg. Co., Cadillac, Mich., has introduced a new type of acetylene generator, with a feed mechanism said to be different from other types of machines now available. A special mechanical device closes the carbide hopper from the water chamber which will allow no water to enter the carbide hopper, while machine is being hauled or moved. When finished with one job, simply turn the control knob to "Off" and put the water lock lever in the upward position and then transport the Super-Feed Generator by automobile-truck or trailer with carbide, water, and gas, in perfect safety. In order to put the generator back in service for the next job turn the control knob to the "Run" position and lower the water lock lever and the unit is ready to go. Simple finger-tip control plainly marked "Start—Off—Run" is all accomplished with one control knob. Can be set to operate on from 2 to 15 lbs. through one control mechanism.

Super-Feed generators are made of heavy sheet steel, brass and aluminum castings. Made heavy enough for mounting on automobile-truck or trailer to be transported from job to job over rough roads. The carbide and water filler caps are hand operated. The caps are easily removed—simply loosen a screw and turn the cap a half-turn and off it comes. No wrench is needed. The sludge drain valve is also hand operates and has a large capacity for quick drainage. It has a large sludge agitator, handy and efficient, equipped with two check valves—double assurance against flash-backs.

To recharge the generator, remove the filler cap on top of the carbide holder and refill. Replace the cap and a new charge is in the hopper. A funnel is furnished with each machine. Refill the water chamber by removing a cap, and inserting the water hose.

» «

Mechanical Pipe Scriber

★ Harris Calorific Co., Cleveland, Ohio, has introduced a new mechanical pipe-scriber. This new product is designed to assist welders in easily, quickly and accurately making layouts for practically all pipe joints. The layouts can be made directly on the pipe or for patterns if desired. The pipe-scriber can be used on all pipe sizes ranging from 2 to 12 in. in diameter.

Harris mechanical pipe scriber.

This mechanical pipe-scriber eliminates the old "cut and try" method. A six-way adjustment permits an accurate layout for every conceivable angle and joint. This new pipe-scriber is a scientifically designed, accurately machined instrument—simple to operate, portable and insures smart, tailor-made welded joints.

An interesting part of the pipe-scriber is the marker crayon which is made of a special fire-resistant composition. The mark made by the crayon will not blow off under the cutting torch flame but assumes a reddish glow—easy to distinguish and follow while cutting.

The pipe-scriber has a definite place in welding shops as well as the sheet metal industry, especially for laying out piping for air-conditioning and ventilating work. Important advantages of the pipe-scriber are its accuracy and efficiency. The pipe-scriber is available for sale through all Harris distributors.

News of the Industry

New York Section A.W.S. Evening Lecture Course

New York Section in conjunction with the Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y., will present the third annual series of Tuesday Evening Lectures on Welding beginning November 22, 1938. Lectures will start promptly at 6:45 p.m. The Welding Handbook will serve as a lecture text. Following is the schedule of lectures:

NOVEMBER 22—Lecture No. 1—Fundamentals of Welding Processes, by Dr. C. A. Adams, consulting engineer, The Edward G. Budd Manufacturing Co.

Fundamentals of Arc, Gas, Resistance and Thermit Welding. Some of the topics to be covered are: Shielded Arc, AC. and DC. Mechanism of Weld Deposition, Manual and Automatic Welding; General Principles of Gas Welding, Oxy-acetylene Flame; Resistance Welding—Spot, Projection, Butt and Flash; Thermit Welding, Thermit Pressure Welding.

NOVEMBER 29—Lecture No. 2—Metallurgy—Welding of Carbon and Low Alloy Steels, by Dr. R. H. Aborn, assistant metallurgist, United States Steel Corp., Research Laboratory.

Metallurgy of Welds and Weldability of Low, Medium and High Carbon Steels and of Low Alloy Steels.

DECEMBER 6—Lecture No. 3—Welding of Nickel and Its Alloys, by F. G. Flocke, welding engineer, The International Nickel Co.—Welding of Nickel Steels, by T. N. Armstrong, The International Nickel Co.

Principles of Welding High Nickel Alloys and Nickel Alloy Steels.

DECEMBER 20—Lecture No. 4—Aluminum Alloys, by G. O. Hoglund, welding engineer, Aluminum Company of America.—Copper and Copper Alloys, by I. T. Hook, research engineer, The American Brass Co.

Recognized methods in welding these nonferrous metals and their alloys; precautions to be used and best methods for successful work.

JANUARY 17, 1939—Lecture No. 5—Qualification Inspection, by W. D. Halsey, assistant chief engineer, Boiler Division, The Hartford Steam Boiler Inspection & Insurance Co.

Principles of Standard Qualifications Procedure of American Welding Society and what is meant by "Qualified Welders." Will also cover methods, both semi-destructive and non-destructive, for inspection of welds.

JANUARY 24, 1939—Lecture No. 6—Testing Procedure, by O. H. Henry, Polytechnic Institute of Brooklyn.—Physical Properties of Welds, by G. E. Claussen, Polytechnic Institute of Brooklyn.

Methods used in testing welds; significance of each type of test; general physical properties of welds and their relation to different types of base metals.

JANUARY 31, 1939—Lecture No. 7—Welding of Ship Structures, by David Arnott, American Bureau of Shipping.

Early developments, advantages of welding, designing for welding, planning work, shrinkage, distortion, residual stresses, framing, specific examples, administration of standards, future developments.

FEBRUARY 14, 1939—Lecture No. 8—Structural Welding—Bridge Welding, by Gilbert D. Fish, consulting engineer.

Design, Miscellaneous Precautions in Planning, Equipment and Organization, Estimating, Shop Work, Erection and Building Code Requirements.

FEBRUARY 21, 1939—Lecture No. 9—Design of Machinery, by C. H. Jennings, Research Laboratories, Westinghouse Electric & Manufacturing Co.

Design, Stress Concentrations, Residual Stresses, Selection of Sections, Materials, Costs, Stresses, Methods and Design.

FEBRUARY 28, 1939—Lecture No. 10—Design of Pressure Vessels, by D. H. Rossheim, The M. W. Kellogg Co.

Advantages of Welding, How to Design for Welding, Tests, Construction, Automatic Machinery, Preparing for Welding, Vessels for Low-Temperature Service, Fabrication, Code Requirements.

MARCH 14, 1939—Lecture No. 11—Design of Welded Piping, by A. W. Moulder, vice-president, Grinnell Co.

Qualification of Welders, Butt Type Strength Welds, Fillet Type Strength Welds, Side Outlet Welds, Welded Fittings and Flanges, Stress-Relieving Welded Joints.

MARCH 21, 1939—Lecture No. 12—Estimating Welding Construction, by Leon C. Bibber, welding engineer, Carnegie-Illinois Steel Corp.

Methods to be employed in estimating welded construction, how costs are affected by design considerations, types of joints, preparation of work, layout, etc.

» «

The American Society of Mechanical Engineers announces the election of the following new officers for 1939 who will assume office on December 9, 1938:

President

Alexander G. Christie, Prof. M.E., Johns Hopkins University, Baltimore, Md.

Vice-Presidents

Henry H. Snelling, Senior Member, Snelling & Hendricks, Washington, D. C.

Wm. Lyle Dudley, V.P. in Charge Design and Sales, Western Blower Co., Seattle, Wash.

Alfred Iddles, Application Engineer, Babcock & Wilcox Co., New York, N. Y.

James W. Parker, V.P. and Chief Engineer, Detroit Edison Co., Detroit, Mich.

Managers

Clarke Freeman, V.P. in Charge Fire Prevention, Engrg. & Underwriting, Manufacturers Mutual Fire Ins. Co., Providence, R. I.

William H. Winterrowd, V.P., Franklin Railway Supply Co., Chicago, Ill.

Willis R. Woolrich, Dean of Engrg., University of Texas, Austin, Texas.

» «

Chicago Section A.W.S. Develops Program for Evening Lecture Course

Chicago Section announces a series of evening lectures on practical welding subjects to be held at Armour Institute of Technology, 3300 Federal St., Chicago, beginning Monday night, December 5, 1938. Lectures will start promptly at 7:30 p.m. All lectures will be given in the new Students' Union building. Following is the schedule of lectures as announced by A. M. Candy, chairman of the Educational Program Committee:

DECEMBER 5—Arc Welding Phenomena and Equipment, by K. L. Hansen, consulting electrical engineer.

Physics of the metal arc, physical properties of bare and coated electrode welds, etc.

DECEMBER 12—Fundamentals and Applications of Oxy-Acetylene Welding and Cutting, by W. B. Browning, process service engineer, The Linde Air Products Co.

History and development of oxy-acetylene welding and cutting equipment. Fundamentals of the oxy-acetylene process, its use and scope in modern industry, including cutting, welding, brazing, flame-hardening and safe practices.

DECEMBER 19—Resistance Welding, by H. A. Woofter, consulting and designing resistance welding engineer.

With particular reference to recent innovations of spot welding equipment.

DECEMBER 20—Importance of Resistanc Welding in Industry, by E. W. Forkner, chief engineer, Federal Machine & Welder Co.

Recent developments in resistance welding equipment, particularly as to decreasing labor costs in many welding applications. Also, research and development work pertaining to welding of various alloys and metals including brass and aluminum.

JANUARY 9, 1939—Metallurgy and Heat Treatment Involved in Welding, by Dr. W. A. Pearl, Department of Mechanical Engineering, Armour Institute of Technology.

Discussing effect of welding on grain growth. Effect of temperature gradients. Effect of multiple-layer welding, etc.

JANUARY 16, 1939—Welded Elevated Tanks, by Harry C. Boardman, research engineer, Chicago Bridge & Iron Co. (also President of A.W.S.).

Discussion of design, fabrication and erection of tanks. A preliminary discussion will be given of process and operator qualifications.

JANUARY 23, 1939 — Inspection of Welds and Methods of Testing, by W. D. Halsey, assistant chief engineer, Boiler Division, Hartford Steam Boiler Inspection & Insurance Co.

Will cover subject primarily from angle of insurance companies and will deal with pressure vessels.

JANUARY 24, 1939 — Inspection of Welded Structures and Testing of Welding Processes and Operators, by R. B. Lincoln, Director of National Weld Testing Bureau, Division of Pittsburgh Testing Laboratories, Pittsburgh, Pa.

(1) Qualification tests as applied to structural welding and fabrication of machinery, (2) Common causes of failure in qualification tests, (3) Continuous weld inspection during construction, (4) Intermittent inspection during construction, (5) Use of x-rays, (6) Use of magnetic powder, (7) Use of welding gauges, (8) Inspection of completed structures.

JANUARY 30, 1939—Structural Steel Welding, by F. H. Dill, welding engineer, Mechanical Engineering Department, American Bridge Co.

(1) Welding of bridges, (2) Welding of buildings, (3) The combination of welding and riveting based on economic values of each process.

FEBRUARY 6, 1939 — Welding Technique and Applications in the Field

OF STAINLESS STEELS AND STAINLESS IRONS, by E. J. Brady, welding engineer, Hollup Corp.

(1) Discussion of various types of stainless steels and iron, (2) Best technique involved in welding various combinations, (3) Types of welding rods best suited for various grades of stainless materials.

FEBRUARY 13, 1939—WELDING OF PRESSURE VESSELS, by A. J. Moses, general manager, Hedges Walsh Widener Division, Combustion Engineering Co.

(1) General design of pressure vessels, (2) Welding procedure, (3) Methods of strain relieving, (4) Use of a-c. welding and d-c. welding, (5) X-ray studies of different types of welds.

FEBRUARY 14, 1939—WELDING OF PRESSURE VESSELS FOR PETROLEUM INDUSTRY, by L. J. Larson, consulting welding engineer.

(1) Design of vessels, (2) Methods of fabrication, (3) Methods of welding.

FEBRUARY 20, 1939—DESIGNING AND WELDING LARGE MACHINES, by A. E. Gibson, president, Wellman Engineering Co.

(1) Typical large welded machine structures, (2) Methods of stress analysis for design work, (3) Methods of showing welding on drawings, (4) Types of jigs and fixtures used for handling machines, (5) Methods of controlling warpage such as peening, preheating and post-heating, (6) Methods of stress relieving.

FEBRUARY 21, 1939—DESIGNING AND WELDING LARGE MACHINE TOOL STRUCTURES, by Everett Chapman, president, Lukenweld, Inc.

(1) Stress analysis of models to scale made of transparent material using polarized light to show stress distribution, (2) Methods of designing these structures, (3) Methods of handling equipment, (4) Methods of testing structures and welding operators.

FEBRUARY 28, 1939—USE OF WELDING IN MAINTENANCE, by E. A. Balsley, welding engineer, Link Belt Co.

Use of arc and gas welding, also gas cutting in general shop and field maintenance work.

Personals

HAROLD S. CARD, formerly development director, Electric Welding Section, National Electrical Manufacturers Association, has established a sales and advertising consulting service with headquarters at 129 Stiles St., Elizabeth, N. J. As many of our readers know, Mr. Card was formerly editor of *The Welding Engineer*.

» «

WILDER A. CHAPMAN has been appointed manager of laboratories for ROBERT W. HUNT Co., engineers, with headquarters at Chicago. Mr. Chapman is a graduate of Tufts College with a B.S. in Chemistry. Following an earlier association with the Solvay Process Co., Mr. Chapman was connected with the Delaware, Lackawanna and Western Railroad for over six years. He joined Skinner and Sherman, Inc. of Boston in 1924 and was secretary, and a director of that corporation since 1930.

» «

JOHN R. JOHNSTON, manager of sales, Milwaukee district sales office of Carnegie-Illinois Steel Corp., has been appointed assistant manager of sales, Chicago district sales office. The Chicago office is one of the corporation's largest district sales offices.

» «

J. N. WALKER has been elected vice-president of Oxweld Acetylene Co., a unit of Union Carbide and Carbon Corp., New York City. Mr. Walker has been general sales manager of The Linde Air Products Company, also a unit of Union Carbide and Carbon Corp.

» «

T. D. CARTLEDGE, formerly assistant general sales manager, has been appointed general sales manager of The Linde Air Products Co., a unit of Union Carbide and Carbon Corp., 30 East 42nd Street, New York City.

» «

DR. FRANK BALDWIN JEWETT, vice-president of the American Telephone and Telegraph Co. and president of the Bell Telephone Laboratories, has been awarded the 1938 John Fritz Gold Medal, said to be highest of American engineering honors, for "vision and leadership in science, and for notable achievement in the furtherance of industrial research and development in communication." The award is made annually for notable scientific or industrial achievement by a board composed of representatives of the four national engineering societies of civil, mining and metallurgical, mechanical, and electrical engineers.

» «

FRANK MALCOLM FARMER, vice-president and chief engineer of the Electrical Testing Laboratories, New York City, has been re-elected chairman of the Engineering Foundation for 1938-39. This is a research organization of the major national engineering societies. Mr. Farmer, who enters upon his third term, is an authority on electrical measurements, electrical insulating materials, testing of engineering materials, and high-voltage cables. GEORGE E. BEGGS, professor of civil engineering in Princeton University, was elected vice-chairman. J. H. R. ARMS will continue as secretary and OTIS E. HOVEY as director.

A.W.S. Activities

CLEVELAND SECTION, A.W.S.—"Single-Pass Electric Welding of Unfired Pressure Vessels" was the subject of a paper by R. M. WALLACE, assistant superintendent, Griscom-Russell Co., Massillon, Ohio. The meeting was held November 9th in Bingham Hall, Case School of Applied Science, Cleveland, Ohio.

» «

OKLAHOMA CITY SECTION, A.W.S.—At the regular meeting November 1, held at the Huckins hotel, E. R. SEABLOOM, research testing engineer of Crane Co., addressed the Section on the subject, "Application of Fusion Welding to Pressure Piping." Preceding Mr. Seabloom's talk, motion pictures on "Pipe Welding and Cutting" were shown through courtesy of the Bastian-Blessing Co. These films pictured the economy of welded piping and the ease of its installation in large buildings. The meeting was well attended.

SAN FRANCISCO SECTION, A.W.S. — The Section held its October meeting on the 21st at the South San Francisco plant of the Western Pipe & Steel Co. Following the brief business session, the meeting was adjourned, members and guests being escourted through the plant of the Western Pipe & Steel Co. to inspect the welded steel dump scows which are being built for the U. S. Government. Details of this interesting work were explained by EUGENE F. AMTHOR, construction engineer, and his assistants.

» «

SAN JOAQUIN VALLEY SECTION, A.W.S.—The regular October meeting of the Section was held in American Legion Hall, in Taft, Calif., on Thursday evening, the 27th.

J. E. JORDAN, vice-president of Compton Metal Homes, Inc., Compton, Calif., presented an interesting paper on the subject, "Recent Developments in Design and Construction of Metal Homes." Much interest was shown in this comparatively new field for welding.

FLOYD SMITH, plant foreman of the Bakersfield Motor Center, of Bakersfield, followed Mr. Jordan on the program with the presentation of his prize-winning Lincoln contest paper: "Repair and Reclamation of Automotive Cylinder Blocks by Electric Welding."

The meeting was well attended. Chairman J. W. STEEN presided.

» «

DETROIT SECTION, A.W.S.—At the meeting held November 10th in the Colonial Room, Detroit-Leland Hotel, HARRY C. BOARDMAN, research engineer, Chicago Bridge & Iron Co. and the new national president of A.W.S., addressed the Section on the subject: "Large Welded Tanks of Cylindrical, Spherical and Spheroidal Shapes."

» «

PHILADELPHIA SECTION, A.W.S.—"Developments in Resistance Welding" was the subject of a paper by O. C. FREDERICK, engineer, General Electric Co., Philadelphia Works. Meeting was held October 24 at the Engineers' Club, 1317 Spruce St., Philadelphia, Pa.

The following subjects are scheduled for the next five monthly meetings of the Philadelphia Section:

November 21, 1938—"Stainless Steel Welding and Design"
January 16, 1939—"New Applications of Gas Welding"
February 20, 1939—"Residual Stresses"
March 20, 1939—"Structural Design and Welding"
April 17, 1939—"Steel Casting and Plate Fabrication"

» «

NEW YORK SECTION, A.W.S.—At the regular meeting November 16, 1938, the Section discussed the subject of structural welding. F. H. FRANKLAND, chief engineer, American Institute of Steel Construction, presented a paper, "Welding in the Structural Field." C. E. LOOS, assistant to mechanical engineer, American Bridge Co. presented a paper similar in nature, "Structural Fabrication by Welding." Mr. Frankland's paper reviewed differences in welding structural steel as compared to welding of tanks, ships, machinery, etc. Effects of shrinkage, hard-

ening and fatigue on design were also reviewed. Mr. Loos, in his paper, discussed principally the fabrication of welded assemblies in the structural shop.

» «

LOS ANGELES SECTION, A.W.S.—"X-Ray Inspection of Welds" was the subject of a paper by RUSSELL J. LOVE, chief engineer, Southwest Welding & Mfg. Co., at the regular monthly meeting October 20th held at the Commercial Club building, 11th and Broadway Sts., Los Angeles, Calif. A. P. MARADUDIN, materials engineer, Standard Oil Co. of California, presented a discussion: "Study and Observations of Stress Distribution with Polarized Light."

» «

CHICAGO SECTION, A.W.S.—It was "President's Night" at the regular meeting of the Section, November 18th, held at the Electric Club rooms, 42nd floor of the Civic Opera building, 20 N. Wacker Drive. HARRY C. BOARDMAN, research engineer, Chicago Bridge & Iron Co. and new president of A.W.S. addressed the Section on the subject: "Welded Steel Spheres, Spheroids and Elevated Tanks." Mr. Boardman discussed design and shop preparation of plates, with emphasis on edge preparation for double-curvature plates, types of welding grooves, and use of backing strips. He also described use of special fit-up devices and methods of controlling contraction.

Future Meetings

November 14-18, 1938
American Petroleum Institute, 50 W. 50th St., New York City.
Nineteenth annual meeting at the Stevens Hotel, Chicago, Ill.

November 28-30, 1938
American Institute of Electrical Engineers, 33 W. 39th St., New York City.
Southern District meeting at Miami, Fla.

December 1-2, 1938
Purdue University Annual Welding Conference will be held at Lafayette, Ind.

December 5-9, 1938
American Society of Mechanical Engineers, 29 W. 39th St., New York City.
Annual meeting in New York City.

December 5-10, 1938
National Exposition of Power and Mechanical Engineering will be held at Grand Central Palace, New York City.

January 23-27, 1939
American Institute of Electrical Engineers, 33 West 39th St., New York City.
Annual Winter Convention in New York City.

February 23-25, 1939
American Society of Mechanical Engineers, 29 West 39th St., New York City.
Spring Meeting at New Orleans, La.

March 8-10, 1939
International Acetylene Association, 30 E. 42nd Street, New York City.
Thirty-ninth annual convention will be held at the Rice Hotel, Houston, Texas. Complete program announcement will be carried in the February, 1939, issue.

Trade News

JOHN D. TEBBEN has been appointed sales manager of the Metallurgical Division, P. R. Mallory & Co., Inc., Indianapolis, Ind. Mr. Tebben was formerly Detroit district manager for the same company.

» «

THE WELDING APPARATUS CO. formerly of 4309 Ogden Ave., Chicago, Ill., has moved to a larger and more modern building at 1733 Wrightwood Ave., Chicago, where they will continue the manufacture of "Positive Arc" welders. The company also conducts a welding school.

» «

THE TORCH SUPPLY & ENGINEERING CO., 1637 E. Vernon Ave., Los Angeles, has purchased the business of Welders Service Co., of Los Angeles. Mr. Swanson, former owner of Welders Service Co., has joined the organization of Torch Supply & Engineering Co., and will have charge of sales.

» «

SEATTLE OXYGEN CO. celebrated its 25th anniversary by moving into a new plant at 5510 East Marginal Way, Seattle, Wash. "Open house" for customers and friends was held on October 28-29 in their recently completed modernistic plant.

» «

SALES BILLED BY GENERAL ELECTRIC CO. during the first 9 months of 1938 amounted to $192,501,173, compared with $260,773,533 during the corresponding period of 1937, a decrease of 26%.

» «

THE HARNISCHFEGER CORP. of Milwaukee, Wis., announces the appointment of the SLIGO IRON STORAGE CO., St. Louis, Mo., as distributor for the complete line of Smoothare welding electrodes. The Sligo Iron Storage Co. has been distributor for many years for the P&H-Hansen line of arc welders.

» «

GENERAL ELECTRIC REVIEWS ITS 60 YEARS Accompanying their dividend payments for the third quarter of 1938, the 209,000 stockholders of the General Electric Co. received an 8-page folder briefly tracing some of the changes which have occurred during the six decades ending October 15, 1938, General Electric's 60th birthday. Of these changes, it is pointed out, none has been more significant, nor of greater importance than the fact that the standard of living of the average American family has steadily risen; and many of these changes, which have brought real wealth to millions of people, have been direct results of the development of electricity.

General Electric's 60th year was fittingly observed in Schenectady, N. Y., recently when the Chamber of Commerce presented the company with a bronze plaque, commemorating the steps leading to the formation of the company and its location in Schenectady. The plaque was presented by Laurence G. Magner, president of the local Chamber of Commerce. It was accepted for the company by Gerard Swope, president.

Construction

THE EDWARD G. BUDD MFG. CO., builders of lightweight rail equipment of stainless steel, has received an order for a seven-car "daylight" type train from the Seaboard Airline Railway. The train will consist of all-chair equipment, with observation and lounge facilities, and will be powered by a 2,000 hp. diesel-electric locomotive built by Electro-Motive Corp. The new streamliner will be placed in service on the New York-Florida run probably in early February.

» «

THE WELDED FABRICATION CO., Los Angeles, Calif., was recently awarded a contract for construction of 50 all-welded lettuce harvesting trailers and racks. These welded steel racks are also used in the harvesting of other vegetables and farm products. The contract is scheduled for completion by December 15th.

» «

THE UNITED GAS PIPE LINE CO., of Houston, Tex., has started work on a 48-mile welded pipeline from the Katy gas field in Waller County to the company's distributing plant in Harris county. The line will be of 10, 12, and 16-in. pipe, the project costing in the neighborhood of $800,000.

» «

S. D. BECHTEL CO., pipe line contractor, of San Francisco, as started work on a 52-mile 18-in. welded natural gas pipe line between Coalville, Utah and Bigelow Hill, Wyo. Contract for furnishing pipe for this line was awarded to National Tube Co., of Pittsburgh, Pa.

» «

SCHENECTADY'S EIGHTH WELDED BUILDING The welded steel framework for the new New York Power & Light Co. building, Schenectady, N. Y., has been completed. This structure marks the eighth building in Schenectady to have an all-welded steel frame. The seventh building, an addition to Ellis Hospital, is rapidly nearing completion. A new State Armory, likewise of welded-steel construction, was finished earlier this year. Welding operations on the New York Power & Light building were carried on by Clauson Iron Co., Inc., Albany, N. Y., using G. E. motor-generator arc-welding equipment and G. E. all-position welding electrodes.

Welded steel framework in Schenectady, N. Y.

H. C. PRICE Co., Bartlesville, Okla., recently has been awarded contracts for the electric welding of the following pipe lines: S. D. Bechtel Co.—140 miles of 8-in. line for the Continental Oil Co. in Wyoming; White Deer Pipe Line Construction Co.—10 miles of 8-in. line for the Illinois Pipe Line Co. in Illinois; I. C. Little—gathering lines for the Carter Oil Co. in Illinois; J. J. Connor Construction Co.—35 miles of 16-in. line for the Northern Natural Gas Co. in Iowa and Minnesota; Williams Brothers Corp.—73 miles of 8-in. and 10-in. lines for the Central States Pipe Line Co. in Illinois; S. D. Bechtel Co.—53 miles of 18-in. line for the Mountain Fuel Supply Co. in Wyoming and Utah. All of the above lines are to be electric welded using Lincoln Fleetweld electrodes.

» «

ANOTHER WELDED STREAMLINER

THE EDWARD G. BUDD MFG. Co. has received an order from the Burlington Lines for a ninth lightweight stainless steel train, which will be added to the Zephyr fleet.

The new train, which will be diesel-electric powered, will follow the same type of construction as the remainder of the fleet, but will embody new operating appliances and comfort facilities.

An innovation in this train will be a new braking system developed by the Budd Co., entirely eliminating the traditional "brake shoe" with its application against the tread of the wheel. In the new method, braking effort will be applied to discs mounted between the wheels. These discs are so constructed that they act as blowers, quickly radiating the heat generated in braking. Extensive tests have proved this new type of braking to be efficient. It is estimated that a train can be brought from a speed of 100 miles an hour to a stop within 2,000 ft. without discomfort to passengers.

Stainless steel, fabricated by the "Shotweld" process will be used in the construction of the cars. The ninth Zephyr will contain a newly-developed diesel power engine built by Electro-Motive Corp., La Grange, Ill. It will have a rating of 1,000 hp.

» «

PIPE LINE SERVICE Co., of Seminole, Okla., will, in the near future, construct 20 miles of 4-in. welded pipeline for the Derby Oil Co. of Wichita, Kan. The line will extend from the Robins to the Wellington oil pools in Sumner County, Texas.

» «

CORPUS CHRISTI CORP., is planning the early construction of a 50 million cu. ft. natural gasoline and recycling plant in the Stratton oil field, of Nueces County, Texas. Welding will be extensively employed.

» «

THE STANDARD OIL Co. of Louisiana plans to lay a 20-mile welded 8-in. pipe line from near Magnolia, Ark., to its main line at Haynesville, La. A four-inch gathering line will also be constructed in the three oil fields of Columbia County, Ark.

» «

TRUMAN & SMITH CONSTRUCTION Co., of Eldorado, Kan., has started a preliminary survey for the construction of a 554-mile welded natural gas line to extend from the Hugoton gas field of southwest Kansas to Kansas City and sections in southeastern Kansas. Sizes of the line in different sections

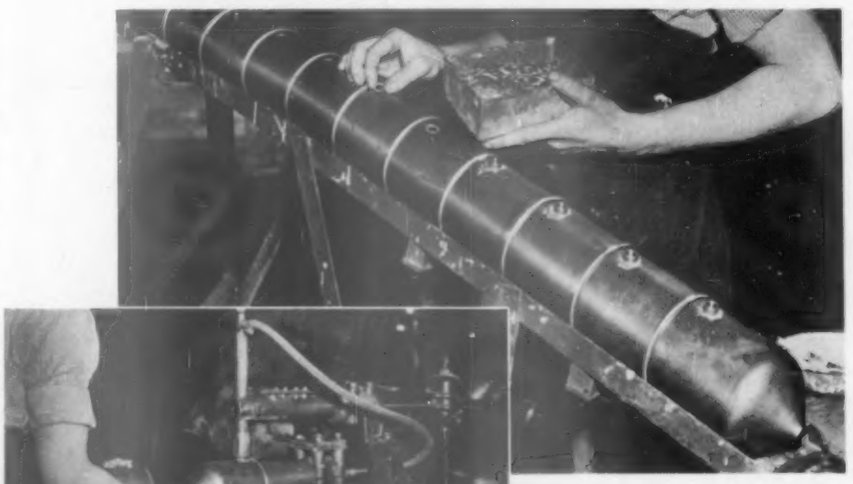
A critical mass production brazing problem ... solved with EASY-FLO

THE PROBLEM—brazing spuds to steel shells of Purolator oil filters used on thousands of automobiles. Here are the factors which made it a critical problem!

(1) The shell was only .042" thick—distortion and damage to the metal from localized overheating had to be avoided; (2) This operation was the "bottle neck" in their production—it had to be speeded up; (3) These oil filters become part of an engine lubricating system—every joint must be sound and stay sound in service.

Successful solution of the problem was due to an efficient method of using the low temperature, exceptionally fluid, quick penetrating action of EASY-FLO and to the small amount required to make reliable joints.

Details about the process developed have just been published. Everyone who joins metals should be interested in reading this story. Ask for the "PUROLATOR" reprint.



Above: After applying HANDY FLUX, operator places EASY-FLO washers, only .010" thick, and spuds in position. . . .

Left: With the aid of a mandrel and pilot, the operator accurately locates shells on a resistance brazer. A press on a foot lever and brazing is done—time, under 5 seconds per shell.

HANDY AND HARMAN · 82 Fulton St., New York

The Improved "Round File" Gas Lighter

Immediate Ignition Assured

The Hood of the Improved "Round File" Gas Lighter is so designed as to form a "pocket" for the gas—an exclusive feature—which assures IMMEDIATE ignition. Get acquainted with the many other superior, exclusive features of Improved "Round File." *Circulars and prices on request.*

SAFETY GAS LIGHTER CO. (Est. 1901) **LYNN, MASS.**

will range from 24 in. down to 6⅝ in. The Kansas Industrial Gas Co., of Chanute, Kan., is promoting the project, which is estimated to cost about $12,000,000. Capacity of the line will be 100,000,000 cu. ft.

» «

The San Joaquin Valley Light & Power Co. has begun construction on a 14-mile 8-in. welded gas line to extend from Merced, Calif., to Livingston. This company will also lay a 10-in. welded line from Davis, Calif., to a point nine miles south of Davis.

» «

The Continental Oil Co., of Tulsa, Okla., has begun operations on the first of three new natural gasoline plants which it will construct in the near future in the "KMA" oil field, of Wichita County, Texas. This project will employ a considerable amount of welding.

» «

The U. S. Navy recently awarded a contract to the Southwest Welding & Mfg. Co., of Alhambra, Calif., for the construction of 25 all-welded mooring buoys to be used at the naval destroyer base in San Diego Bay. These steel buoys will be cylindrical in shape, with dimensions approximately 8 by 16 feet in diameter. Work on this large contract will be started in the near future and will require about nine months to complete. Cost of the project including mooring chains and installation of buoys will be about $385,000.

» «

Welding Will Add 13 Stories—Contract for the addition of 13 stories to the present 9-story Houston Chamber of Commerce building, on Main street at Walker, has been awarded to the W. S. Bellows Construction C. The work is possible because the foundation of the existing structure was designed for a 22-story building. The new construction will be carried on without disturbing existing tenants, including a large retail store. Noise will be eliminated by welding the steel frame. The steel work is under contract to the Mosher Steel Co. of Houston, and fabrication is under way.

Foreign News

Britain's Highest Pressure Welded Boiler Drum

Unusual interest attaches to the installation, just completed, of a high-pressure forced-circulation boiler at the engineering works of G. and J. Weir, Ltd., Cathcart, Scotland. This boiler has been installed largely in order to provide research and testing facilities in view of the probable continued development of the forced-circulation type of boiler, and as the operating pressure is 1,000 psi.—highest for this type of boiler in the United Kingdom—it will be possible to obtain extended practical experience of both the plant and the necessary auxiliaries under operating conditions of the severest kind.

A notable feature of the boiler is the employment of fusion welding throughout its construction and especially in the fabrication of the steam and water drum. No fusion welded drum for a pressure approaching 1,000 psi. had previously been attempted in the United Kingdom. It was thought in some quarters that the cost of production of such a drum would be excessive, but actually the drum has not only proved a complete success mechanically, but the cost of production proved to be substantially less than if forging had been adopted.

The fusion welding of the drum was carried out under Lloyd's Class I and the boiler insurance company's regulations. The drum is 15 ft. 5 in. in overall length, 3 ft. 3 in. in internal diameter and 2½ in. thick. It weighs over 9½ tons.

The regulations governing the manufacture of Class I fusion-welded pressure vessels now entail complete examination by x-rays. The plates used were manufactured to a strict analysis and were subject to a very thorough examination. The joint edges were planed so that on assembly an almost parallel-sided U-groove was formed. This resulted not only in economy in weld metal, but also assisted in the x-ray examination, enabling minor faults to be more readily detected. Any lack of side-wall fusion was shown by being concentrated in the plane of the x-ray. As each run of metal was deposited, it was continued beyond the seam to a test piece, 2 ft. in length, welded under conditions identical to those of the vessel.

"FALCON" ELECTRIC PREHEATING AND STRESS RELIEVING HEATERS . . .

for welding pressure piping including nozzles, valves, fittings, etc.

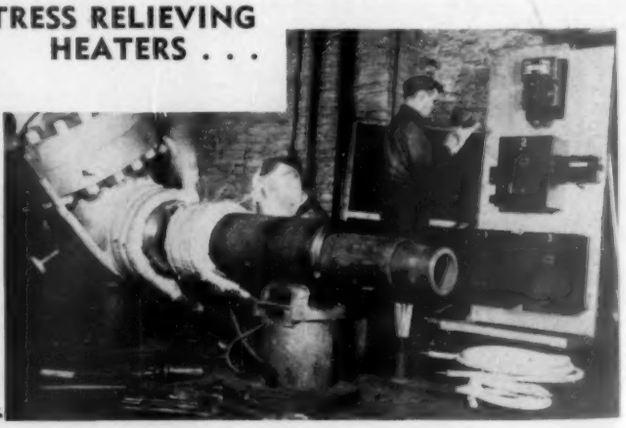


Illustration shows position of two coil type wrap-around heaters for preheating while welding 8" pipe to Series 1500 valve neck, using multiple point automatic temperature control. *Heat available at all times during welding permitting deposit of best quality of metal without interruption.*

A third coil is added over welding space to raise joint to stress relieving temperature. Heating cycle complete from start to finish without removal or replacement of units.

Blanket type insulation provided over heaters during operations for heat conservation.

SOLID CLAMP-TYPE HEATERS also available for maximum temperatures up to 1850°F.

DESCRIPTIVE CATALOGUE—TEMPERATURE CURVES
QUOTATIONS GLADLY FURNISHED
SUBMIT DETAILS OF YOUR REQUIREMENTS

H. O. SWOBODA, INC. • NEW BRIGHTON (2) PA.

The making of the drum involved the deposition of approximately 224 lb. of weld metal. When all the welding was completed the extreme outside and inside runs of metal were dressed off, leaving a flush surface both inside and outside the drum. The vessel was then radiographed and x-ray graphs of the complete longitudinal and circumferential seams were prepared for examination. After welding, the entire vessel was slowly heated to 620 deg. C. (1115 deg. F.) in a large furnace in order to relieve all stresses, and subsequently the finished drum was cleaned for hydraulic tests.

The heating surfaces of the boiler are composed of 1¼ in. outside diameter mild-steel tubes, suitably bent and welded together. Great care has been given by the makers to the method of manufacture of the elements. Cold-drawn tubing was employed, and bending was carried out cold on a precision machine. All bends were relieved of stress by heat treatment and all tube welds were executed in such a way as to eliminate entirely internal oxidation, the welds being subsequently normalized.

Current Reviews

"Electric Welding," by Morgan H. Potter, Instructor at Wm. H. Dunwoody Industrial Institute. This is a compact cloth bound volume, retailing at $1.25, covering the fundamental principles and applications of the various types of arc welding. It has been prepared for the apprentice or the man who is just entering the welding trade. Welding machines, quality of weld metal, operation of the arc, preparation of parts for welding, procedure for welding in all positions, etc., are among the subjects covered in Mr. Potter's new book. The publisher is American Technical Society, Drexel Ave. at 58th St., Chicago.

» «

"Outline for a Course of Study in Oxy-Acetylene Welding" has been prepared by C. E. Barker, Director of Industrial and Vocational Education, San Francisco Public Schools. The outline is in mimeographed form, 12 pages, and should be of interest to other instructors in the welding and cutting field. From a review of the subjects covered in the outline, it is evident that this course is planned to be of a very practical nature. Copies of the outline can be secured by writing to C. E. Barker at the address above noted.

Recent Patents

Welded Underframe for Mine Cars

2,128,333. Walter H. Statler, Bethlehem, Pa., assigned to Bethlehem Steel Co., Pennsylvania. Filed Nov. 23, 1935. Issued Aug. 30, 1938. This patent relates to a simplified manner of forming the underframe members of railway cars, particularly small service cars, such as mine cars. The method comprises forming the underframe members with straight cut ends and welding the flanges directly together without additional connecting means between the webs of the members. This obviates the necessity of forming special shaped ends and using rivets or bolts and the punching of holes in the parts connected.

» «

Multiple-Nozzle Blowpipe

2,129,672. James H. Bucknam, Cranford, N. J., assigned to Union Carbide and Carbon Corp. of New York. Filed March 31, 1934. Issued Sept. 13, 1938. A multiple-flame blowpipe is provided for use in machine welding. A unit block having a plurality of gas passages carries a number of nozzle tips engaged frictionally in the passages. The frictional fastening of the tips permits easy replacements. A single source of gas supplies the several nozzles. The tips and the corresponding passages are substantially parallel and close enough together to produce a continuous elongated heating flame.

» «

Multiple-Jet Blowpipe

2,129,681. Frank C. Geibig, Westfield, N. J., assigned to Union Carbide and Carbon Corp. of New York. Filed May 18, 1934. Issued Sept. 13, 1938. A multiple nozzle blowpipe is described which is similar to the blowpipe in patent No. 2,129,672, discussed above. However, the Geibig patent is concerned principally with the provision of a cooling jacket in the nozzle block for cooling the several tubes.

» «

Electric Welding Machine

2,129,845. Thomas M. King, Hinsdale, and Ladislav Stastney, Cicero, Ill., assigned

Okocord
EXTRA FLEXIBLE
WELDING CABLE

● **The ideal welding cable must be flexible, must stand abuse and be perfectly insulated.**

Okocord Welding Cable embodies these three attributes. It is extremely flexible, because the conductor is made of a great many fine copper wires. It withstands mechanical abuse because it is made with a jacket of tough, tire-tread type of 60% rubber. It has perfect insulation because it is insulated by The Okonite Company —an acknowledged leader in the insulation field since 1878.

For long trouble-free service, use Okocord Welding Cable.

1938 Marks Our 60th Year of Service
THE OKONITE COMPANY
Founded 1878
EXECUTIVE OFFICE: PASSAIC, NEW JERSEY
HAZARD INSULATED WIRE WORKS DIVISION
THE OKONITE-CALLENDER CABLE CO., INC.
New York Boston Seattle Buffalo Chicago Dallas Detroit Atlanta
Philadelphia Los Angeles Pittsburgh St. Louis Washington San Francisco
OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

Ryerson a dependable source for Welding Rod

● Ryerson Engineers have developed a series of rods that are outstanding for Quality production. More than twenty types, including both electric and gas rods, are carried in stock. Whether you need a shielded arc type for production work or a stainless steel rod you can be sure of immediate shipment... *Write for Bulletin which gives complete data.*

ELECTRODES

Ryerson
Shielded Arc Type No. 215
Shielded Arc Type No. 216
Shielded Arc Type No. 217
Green Processed No. 18
Copper Coated No. 206
Copper Coated No. 210
Cast Iron

Ryerson
Green Processed No. 6
Bare Mild Steel
Brown Processed
White Flux Coated
High Carbon White Flux Coated
Blue Flux Coated

GAS RODS
3½% Nickel Steel
High Carbon Bare No. 2110

Ryerson
3½% Nickel Steel Flux Coated
High Manganese Steel
Hard Surfacing
Allegheny Stainless Flux Coated
Allegheny Stainless No. 44

Tobin Bronze
Allegheny Stainless Bare
Hard Filler

JOSEPH T. RYERSON & SON, Inc., Chicago, Milwaukee, St. Louis, Detroit, Cleveland, Cincinnati, Buffalo, Boston, Philadelphia, Jersey City

to Western Electric Co., Inc., New York, N. Y. Filed Sept. 11, 1936. Issued Sept. 13, 1938. This interesting patent discloses an electric welding machine particularly adapted for welding contacts to switch springs or other elements of electrical apparatus. A specific utility is apparent in the welding of elements of gold, silver, palladium, and other noble metals. In the machine a continuous strip of contact metal is advanced intermittently through a guide passage to a pair of hinged jaws pivotally mounted adjacent to a pair of electrodes. A portion of the strip is fed between the jaws which are clamped together to grip the stock and then rotated to shear a section or contact from the strip. The jaws then carry the severed contact into a position in advance of a pusher rod which unclamps the jaws and delivers the contact to the welding position on a spring member placed between upper and lower electrodes. The electrodes are then compressed to weld the parts. This machine appears to have utility in high-speed welding of small parts.

» «

Welding Nozzle

2,130,261. James H. Bucknam, Cranford, N. J., assigned to Union Carbide and Carbon Corp., New York. Filed May 29, 1934. Issued Sept. 13, 1938. This patent relates to a multiple-flame blowpipe of the type described above in patents Nos. 2,129,672 and 2,129,681. In welding a seam by the fusion process, or in depositing a line of fused metal upon a metallic body, the metal ahead of the welding point is usually preheated and progressively raised to the melting temperature at or just ahead of the welding point. As the metal is fused the molten puddle in the rear of the welding point may be exposed to the influence of the air and made brittle and porous due to oxidation with or without occlusion of gases which are derived principally from the air. Such exposure of the weld may cause the weld to be hardened by the too rapid extraction of heat therefrom by the air and the adjacent body metal. These detrimental effects are accentuated as the speed of welding is increased, because at high speeds the puddle passes quickly out of the heating zone. This limits the speed which can be used, particularly where high quality welds on sheet metal are to be made. The inventor protects the molten metal in the rear of the welding point by directing upon the extended puddle a gas flame, the heating effect of which upon the puddle will be of a relatively low value as compared to the heat applied to the weld. A unit nozzle block of the type described in the previous two patents is provided in the rear with a protecting or normalizing heating tip. This tip is supplied from a gas source independent of the welding tip supply. This rear tip heats the rear puddle as the work progresses and prevents the harmful effects which occur when the heating is not applied.

» «

Well Pipe Joint

2,130,587. Joseph J. Kane, Galveston, Texas. Filed Nov. 20, 1936. Issued Sept. 20, 1938. In the drilling of wells it is desirable to provide one or more strings of pipe in the well as a casing for the well bore and also to conduct the oil from the well. It has been found desirable to provide a joint or connection between the sections of pipe which could be formed quickly by welding. The inventor provides a pocket which is located between the upper end of the lower section of pipe and the outside surface of the upper section of pipe. The upper end of the lower piece has a bell shaped portion which receives a spigot portion of the upper section of pipe. A pocket is thus provided for holding the welding material.

» «

Anti-Flashback Blowpipe

2,130,344. Wilgot J. Jacobsson, Elizabeth, N. J., assigned to Union Carbide and Carbon Corp., New York. Filed Aug. 8, 1934. Issued Sept. 20, 1938. To avoid popping or flashback a return bend conduit is used in a blowpipe to connect the discharge end of an oxygen-air injector with a stem extending from the forward end of the blowpipe handle to the discharge end of the blowpipe. Such a construction keeps the burning gas mixture from receding into the blowpipe passages.

Consult your authorized Willson Distributor for information on other Willson Welding Goggles, Helmets, and Handshields.

THE CHIP-WELD GOGGLE, STYLE DC50, combines the protective qualities of two separate goggle types—chipping and welding. Fifty mm. clear Super-Tough lenses furnish strength against impact of flying particles, and hinged frames which may be readily raised are furnished with 50 mm. Willson-Weld lenses for protection against injurious light rays. Goggle cups are molded to fit the curves of the face and may comfortably be worn over correction spectacles.

DOUBLE WILLSON
PRODUCTS INCORPORATED
READING, PA. U.S.A.

Trade Literature

HARD-FACING FOLDER REVISED — "Hard-Facing with Haynes Stellite Rod (Oxy-Acetylene Process)," has just been completed by Haynes Stellite Co., a unit of Union Carbide and Carbon Corp. The revised folder presents the complete procedure for hard-facing steel wearing surfaces by the oxy-acetylene process. The procedure is condensed so that it can readily be followed by a welding operator, even when he is actually hard-facing a part. In addition, the publication contains all necessary data on the different grades of Haynes Stellite hard-facing rod. The folder lists a large number of applications of Haynes Stellite rod by the oxy-acetylene process, and indicates exactly what alloy should be used for protecting each part. A similar revised folder presents comparable data for hard-facing by the metallic arc process. Copies of both publications can be obtained from Haynes Stellite Co., Kokomo, Ind.

» «

NEW WESTINGHOUSE CATALOG—A ribbon of paper 11,000,000 ft. long and 5 ft. wide has begun whirring through the presses to form 82,000 copies of the new 1939-40 general catalog, listing some 10,000 styles and sizes of products of Westinghouse Electric & Mfg. Co. On its pages is written the story of electric power, from generators to washing machines and toasters, from titanic steel mill motors to tiny one-twentieth horsepower motors to drive electric shavers.

» «

"AIRCO PROCESS OF STEEL CONDITIONING WITH THE OXY-ACETYLENE DESEAMING TORCH"—This 22-page well illustrated bulletin describes Airco's equipment and process of oxy-acetylene torch deseaming.

Surface conditioning of steel blooms, slabs and billets preparatory to finish rolling has always presented a major problem to the practical steel producer. Necessity of removing cracks, seams, scabs and crows'-feet from steel stock to avoid surface imperfections in the finished product, has required chipping with the pneumatic chisel—a costly and time-consuming operation—for the steel maker. This operation required large storage space for semi-finished stock, and involved delays in the rolling program, due to classifying and reassembling parts of "heats" that have been set aside for chipping.

Recent developments in torch deseaming, or as sometimes known as "scarfing," include the conditioning of small billets—low-carbon alloy and high-carbon steels—both cold and while hot, on the rolling mill table. Machine-driven torches have been developed for completely refacing bloom and billet stock at the rolling mill, and for edge conditioning of slabs. Widespread interest in the process indicates that torch deseaming is one of the most significant developments of recent years in the art of making steel.

Copies of this bulletin can be obtained by writing on company letterhead to Air Reduction Sales Co., 30 E. 42nd St., New York City.

"WHAT GOES IN THE BOTTLE?"—This four-page bulletin describes the tests that are applied to Independent acetylene cylinders to make sure that they comply with the provisions set up by the Interstate Commerce Commission regulating transportation.

» «

"NORTON WHEELS FOR WELD GRINDING"—This small folder just issued by the Norton Co., Worcester, Mass., describes straight, cup and cone wheels manufactured by Norton for weld grinding.

» «

WESTINGHOUSE FLEXARC ACCESSORIES—Arc welding equipment and supplies are described in an 8-page illustrated booklet published by Westinghouse Electric & Mfg. Co. A brief description, style number and price are listed for such items as helmets, lenses, cover glass, electrode holders, protective clothing, miscellaneous accessories and welding publications. Copies of this Catalog Section 26-620 may be secured from the nearest district office of Westinghouse or from headquarters at East Pittsburgh, Pa.

» «

HORACE T. POTTS CO., Philadelphia, Pa., warehouse distributors of steel and supplies for over a century, recently issued the 21st edition of their Steel Handbook. Considerable space is devoted to welding accessories, especially shielded-arc type electrodes.

If YOU'RE DOING WELDING

You Can't Afford to be Without...

The New MARQUETTE A.C. ARC WELDER

Because: it soon pays for itself through its super-efficiency and fast low-cost operation.

Because: it is moderately priced at from $155 to $225, and

Because: it is sold by Jobbers on an easy payment plan.

You can put yourself in the fast-growing, profitable welding business without investing a large sum in equipment when you buy a MARQUETTE A. C. ARC WELDER.

- Three models at three prices . . . a size and price to fit your needs.
- Oversize transformer gives steady even arc at all 15 heat stages.
- A tap for every heat, a heat for every job . . . no dials, no combinations, no confusion.
- Ample ventilation through bottom screen and louvered top.
- Every model fully equipped . . . nothing extra to buy.

Every Marquette A. C. Arc Welder is listed by Underwriters' Laboratories, Inc., and carries their Re-examination Service Marker.

MARQUETTE MFG. CO., INC.
MINNEAPOLIS, MINNESOTA

New Technical Literature

We have listed on this page brief reviews of new technical literature prepared by experts in the employ of welding equipment manufacturers. Any literature you may desire will be sent to you free of charge. Merely check or mark the serial number of the paragraph on the order blank at the bottom of the page. No obligation.

Eye Protection Equipment

(49) Chicago Eye Shield Co. has just issued its 24th catalog edition covering industrial head and eye protection equipment. Several new types of welding goggles are described, as well as a complete new line of moulded bakelite head shields for arc welders. 48 pages.

Welding Torch Bulletin

(50) Victor Equipment Co. has just issued a new welding torch bulletin listing several new torches added to its line. Included are a new pipeline torch and two new automotive and sheet metal torches equipped with automatic cut-off device. Included also are excellent illustrations of various types of welding flames.

Jackson Electrode Holders

(51) A pocket size folder describes the Jackson line of insulated electrode holders. Prices are included and also details and costs of replacement parts.

Farm Tool Reclaiming Units

(52) New Process Plow Welding Co. has completed a new catalog covering its line of reclaiming units for all types of tilling and cultivating tools. This new catalog also contains descriptions and prices of welding supplies distributed by this company on a jobbing basis.

Hard Facing Rods

(53) Steel Sales Corp. has available a bulletin "Amsco Hard Facing Welding Rods" which describes Amsco No. 459 and 217 welding rods. Typical applications and welding instructions are given.

Nickel Manganese Rod

(54) Steel Sales Corp. has issued bulletin "Amsco Nickel Manganese Steel Welding Rod" which describes this rod and its typical applications.

Brazing Flux

(55) "Handy Flux" is the title of Bulletin No. 9 distributed by Steel Sales Corp. Bulletin gives information on use of Handy Flux for low-temperature brazing. Complete directions for using the process are included.

Silver Brazing Alloy

(56) "Easy-Flo" brazing alloy is described in Bulletin No. 10 distributed by Steel Sales Corp. This low melting point alloy is for brazing light gauge ferrous or non-ferrous metals. This company also has available bulletins No. 1 and No. 5 covering use of silver solders, "Sil-Fos" and "Easy-Flo" brazing alloys.

Speedarc Welders

(57) The Ideal Electric & Mfg. Co. has issued three circulars, No. 912, 913 and 914 giving the technical data on its high power factor synchronous motor-driven Speedarc welders. Major emphasis is placed on high power factor, but attention is called also to high efficiency, fast recovery, and constancy of adjustment.

Oxy-Acetylene Equipment

(58) The Alexander Milburn Co. has issued a 34-page pocket size catalog containing complete information on its line of oxy-acetylene cutting and welding apparatus.

Welding Supplies

(59) American Agile Corp. has issued a loose-leaf catalog describing Agile welding electrodes and listing prices. Agile welding mirror lenses are described. It is claimed that these lenses give 42% more visibility and adequate eye protection.

100-Ampere Arc Welder

(60) Wilson Welder & Metals Co. has a pamphlet describing the new Model SC motor-driven generator arc welder rated at 100 amp. for light gauge work. It is claimed that this machine will operate satisfactorily on the thinnest material that can be arc welded. Also suitable for fender repair work in garages.

Olympic Bronze Catalog

(61) Olympic Bronze is a new structural alloy produced by Chase Brass & Copper Co. The new catalog details methods of welding Olympic Bronze, including carbon arc, metallic arc, and oxy-acetylene.

Torchweld Equipment

(62) Torchweld Equipment Co. has a bulletin describing the new Torchweld Twin Mixer Cutting Torch and the Torchweld Automatic Welding Torch. The cutting torch can use any type of fuel gas with oxygen, making it a universal cutting torch. It is constructed with two mixers which are interchangeable.

Preventing Welding Fires

(63) A publication of the I.A.A. which presents very concisely information on how welding, and cutting fires may start, also giving important and common sense rules for preventing such fires. 16 pages.

Copper and Copper Alloys

(6) Reprint of a technical paper by Maurice G. Steele, of Revere Copper and Brass, Inc., which summarizes important properties and typical industrial applications of 30 types of coppers and copper-base alloys. 4 pages and chart.

Eye Shields for Welders

(65) A small folder issued by Jackson Electrode Holder Co. describes four types of wide-vision eye shields for oxy-acetylene welders, spot welders and general eye protection in industrial plants. Pocket size.

Plastic Iron

(66) Northeast Metals Co. has literature describing application of its Plastic Iron. It is stated that arc welds on cast-iron can be made pressure tight quickly and permanently with Plastic Iron. 2 pages.

Welding Aluminum

(67) Aluminum Co. of America has published a 48-page pocket-size booklet covering the gas welding and electric welding of aluminum and its alloys. Space is devoted to welding of heat-trated aluminum alloys and of aluminum castings.

Stainless Steel Welding

(68) Arcos Corp., has issued Arcos Technical Bulletin No. 3 of 24 pages describing stainless steel and special alloy welding procedures and welding electrodes. Contains new and previously unpublished information on the physical and metallurgical characteristics of stainless and special alloy welding. Bulletin No. 3 also includes a complete alloy welding manual for engineers and operators.

Welding Electrode Catalog

(69) The Champion Rivet Co. has issued a new catalog covering its line of welding electrodes. Technical data is included on operation of the welding arc.

THE WELDING ENGINEER November, 1938

608 So. Dearborn St., Chicago, Ill.

Please send me the literature as checked (X) on the list below:

49 ☐	54 ☐	59 ☐	64 ☐
50 ☐	55 ☐	60 ☐	65 ☐
51 ☐	56 ☐	61 ☐	66 ☐
52 ☐	57 ☐	62 ☐	67 ☐
53 ☐	58 ☐	63 ☐	68 ☐
			69 ☐

(To be sure of receiving literature ordered please indicate below your company affiliation and position.)

Name _____

Street Address _____

City _____ **State** _____

Company Affiliation _____

Position _____